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ACUTE METASTATIC BRAIN ABSCESS

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IN the past the results following operation for metastatic brain abscess have been very poor. In fact, when the diagnosis of a metastatic abscess was established, it was expected that the outcome would prove fatal. Only a few cases of recovery have been reported, and in each of these cases, with the exception of one, it is assumed that the lesion was well encapsulated.

When Schorstein's[18] paper was published in 1909, he stated that he knew of no case of recovery, either in his series or in cases reported from 1815 to 1903. In 1925, Hurst[18] reported an instance of recovery following an operation performed by Sargent in the early part of 1912. Although nothing was said in his report as to whether the abscess was encapsulated or not, it is believed that the lesion was well walled-off on account of the duration of the symptoms. Furthermore, at the time of operation about two ounces of yellowish-greenish fetid pus were evacuated. This amount of pus is not usually found in an early acute metastatic abscess. This is the first case of recovery following operation for a metastatic brain abscess known to the writer. The patient, who was operated upon in 1912 at the age of 57 years, was well and healthy in every respect thirteen years later at the age of 70, when the case was reported.

In 1917 Roulland[17] reported the first case of *acute* metastatic abscess with operation and recovery. This patient was a soldier who sustained a gunshot wound of the thorax followed by empyema in September, 1916. A pleural fistula was present in January, 1917. On June 3, 1917, the patient complained of headache and developed hemiplegia of the left side. He vomited on the 5th. Operation was

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performed on June 6, which was probably six or seven days after the invasion of the brain by the septic embolus or nidus of infection. At operation, when the subcortical area was explored, brownish (probably hematogenous) material followed by pus was obtained. By August 25 the patient had recovered sufficiently to be able to walk.

In 1925, Barling[3] reported a case complicating either bronchiectasis or lung abscess of several years standing. Although the patient already showed manifestations of cerebral involvement, the operation was performed for the lung condition on Aug. 8, 1923. The thoracotomy wound healed, but the cerebral symptoms continued and increased. He was operated upon more than a month later following the onset of the cerebral manifestation. Therefore, the abscess was a chronic one. No report was made as to the resistance offered by the exploring forceps when a considerable amount of pus was evacuated, and in view of the fact that the abscess was drained by a tube, inspection of the immediate area about the abscess could not have been done. The patient's hemiplegia disappeared on the following day, and the patient made an uneventful recovery. Culture of the pus showed streptococci, staphylococci and coliform bacilli.

In 1924, Eagleton[6] reported a most unusual case (Case XVII). He operated upon this patient in 1914. The abscess in this instance had a very dense wall, contained thick pus, and therefore was of long standing. It was found at a very great depth, 6.5 cm. from the surface, and involved either the internal capsule by compression and edema, or was actually situated in the internal capsule. This patient was operated upon in two stages and made an uneventful recovery except for a slight hemiplegic gait. The involved arm recovered completely.

Gardner[9] in 1928 reported a case of metastatic brain abscess secondary to a lung abscess which followed tonsillectomy. The patient was operated upon in April, 1926. The abscess was evidently chronic. No mention of encapsulation was made. Culture of the pus revealed staphylococcus albus. He was discharged 44 days after operation, at which time the wound was healed and the patient was free of cerebral symptoms. About two months later the lung abscess was drained, the patient made an uneventful recovery and was in good health when the report of the case was made about a year after operation.

Parker,[16] in 1930, in his series of twenty cases proved by autopsy or operation reported one case which showed marked chronicity. The lesion was operated upon and was removed in the belief that it

was a tumor, and its true nature was not revealed until section of the lesion had been made following removal. The wall of the abscess cavity was very thick. The incision healed without infection. This is evidently the case which was operated upon by Adson[1] and reported by him in 1935.

Cairns,[4] in 1934, reported two cases of recovery in abscesses secondary to "pyaemia from skin and subcutis"; therefore it is assumed that these two cases were metastatic in origin. Whether they were encapsulated or not is not stated. It is not known whether Case 8 was one of these two cases or not, and from the report of the case it is not clear whether the brain abscess was secondary to bronchopneumonia, an abscess of the sole of the foot, a cervical abscess, or osteomyelitis of the skull. Following three operations for a parietal lobe abscess, the patient's ultimate recovery of function was "nearly perfect."

In a review of the literature, one is impressed with the rather high percentage of cases in which the lesion is *single* or *solitary*. Schorstein collected 19 cases from Brompton Hospital and London Hospital. In 18 of these cases in which the complete autopsy report was available, 11 showed that the lesion was single and 7 multiple. With 33 additional records added—51 cases: a single abscess was found in 32, or 62 per cent, and multiple abscesses in 19, or 37 per cent.

In his book published in 1924 Eagleton stated that examination of the literature of the last twenty-five years showed that 45 per cent of all metastatic brain abscess are solitary. Parker gave the percentage of solitary abscess as being 50 per cent. Evans in a report of 17 cases secondary to bronchiectasis stated that 11, or 64.7 per cent were single. He did not give figures for abscesses complicating empyema, or lung abscess. In the 24 instances in which the lesions were secondary to extrathoracic suppuration, the abscess was single in 11 cases.

In Cohen's[5] series of five verified cases of abscess, two of the abscesses proved to be single at autopsy. No report is made regarding the other three. In Gardner's two cases, one was single.

These figures prove that the percentage of isolated, single metastatic abscesses are found more frequently than has been believed. On the whole, one is justified in stating that about 50 per cent of these lesions are single.

Referring to the *acute* or *chronic* condition of the abscess, i. e. whether a definite wall had been established or not, Schorstein stated that in 18 cases only 4 had a definite capsule and 14 did not.

Parker's statistics showed that 5 of the cases in Group II had grossly and microscopically a fairly well defined capsular wall, while 3 cases in Group III showed definite encapsulation.

Evans[8] in a series of 46 cases did not give any positive information as to whether the abscess was acute or chronic. However, he, as have most writers, observed that the duration of the cerebral lesion is short, and that in 17 patients in whom the lesion was secondary to bronchiectasis 14 died within three weeks of the initial symptoms, 9 within fourteen days. Parker observed from the study of 20 cases at autopsy that the course of metastatic abscess from pulmonary and pleural origin is much shorter than when it is due to other causes. Schorstein noted that, in his 19 cases, the duration of illness averaged ten days from the onset of cerebral symptoms.

Considering the following facts: 50 per cent of metastatic brain abscesses are single lesions; a large number are secondary to bronchiectasis; in 17 cases in which cerebral abscess was secondary to bronchiectasis, Evans found in 16 of them that brain abscess was the only other focus in the body other than that in the lung; why is it that more cases of brain abscess of metastatic origin have not recovered?

Causes of Death

It is granted that there is no likelihood of recovery following operation in cases of multiple abscesses of the brain. Nowadays, bronchiectasis, lung abscess and empyema, which are the most frequent foci of infection from which metastatic cerebral abscesses develop, are well treated either by irrigation, operation, or postural drainage. The recovery average from these conditions is good. Should the brain abscess be properly and successfully treated, the recovery rate from the two conditions *should* be higher. Why have so many of these patients died?

The patient is most usually, although not always, in a debilitated condition when the metastatic lesion in the brain begins to form. In cases of general sepsis it may even be overlooked and be but a part of the general septic picture, and therefore may be unrecognized.

It has been observed by most writers that these abscesses extend very rapidly, especially when they are secondary to pleuro-pulmonary conditions, and to such an extent that the ventricle is involved before time has elapsed for encapsulation to take place. Death in the majority of instances takes place within three weeks, and in many instances within ten to fourteen days after the onset of symp-

toms. Therefore, it is believed that delay in operation, which is properly advocated by most writers in cases of ordinary abscess secondary to infection of the mastoid, middle ear or accessory sinuses, may be responsible to a large degree for the higher mortality rate.

Most of the operators have used drainage tubes for drainage purposes. These tubes as a rule do not allow sufficient drainage in that they become plugged with soft necrotic brain substance, the trephine opening through which they are inserted is insufficient in size to allow of removal of the necrotic material at the time of operation, and does not permit aeration of the infected region. Furthermore, the tubes act as foreign bodies which not only fail to decrease the encephalitic process, but increase it. In many of these cases, violent spasms of coughing are the rule, and at each spasm the brain substance is propelled against the fixed tubes, causing continuous trauma of the brain.

In the chronic cases—those who are so fortunate as to live sufficiently long for a definite capsule to be established, and in which the abscess is single or solitary—it usually encroaches very closely upon the ventricle. Operation in these cases has been too long delayed. Originally, each one of these began with a small area of suppuration, but with a considerably larger area of encephalitis and necrosis of the brain about it. By the time encapsulation has taken place, an enormous area of brain substance has been destroyed in the suppurative encephalitic process. When the abscess is drained, the intervening tissue between the wall of the abscess and that of the ventricle is so thin that ventricular rupture is likely to occur. The neighboring position of the abscess in its relation to the ventricle is noted by Woltman[10] in four cases (Chart I). The dire result, meningitis, takes place, and the patient dies.

Symptomatology

In some cases the symptomatology and signs leading to the diagnosis of metastatic brain abscess may be so obscure as to make the diagnosis most difficult or render it impossible to make the diagnosis and localization. The signs and symptoms have been described so many times, and are so well understood by those interested in the subject, that it is not considered necessary to review them fully. The onset is usually apoplectiform in character. The outstanding associated features are sudden severe pain in the head or headache, vomiting, and dizziness. There may or may not be a chill or chilly sensations. Prostration is marked. The pulse is not slow. Stupor or slowing of the mentality is usually present. Coma in the early

stage may be present but it is uncommon. The temperature is usually elevated—102 to 103°, but it may fall to slightly above normal or subnormal. On account of the early and extensive involvement of the brain, a wide range of signs will be present if the lesion involves the usual sites in the frontal, parietal and occipital lobes. Hemiparesis, hemianesthesia and homonymous hemianopia may be present on the third or fourth day, or even earlier. The hemiparesis rapidly becomes hemiplegia. This is not the rule in other types of brain abscess. If the abscess is left-sided in the cerebrum, motor aphasia is frequently present. Leukocytosis, with increase of the white cells from 13,000 to 23,000, is present. A splendid discussion of the symptomatology is given by Macewen.

Pathology of Solitary or Single Abscess

Whether the actual infecting substance, nidus, embolus, bacteria, or thrombus lodges or forms in the artery or vein of the brain is still a disputed question. One is inclined to believe that in most instances the artery is involved. Globus[11] holds this opinion. There are various reasons for this belief. In the first place, in the majority of cases the onset is sudden and apoplectiform in type, similar to sudden arterial occlusion of the arteries of the extremities. The extensive range of the signs and symptoms present, i. e., hemiparesis or hemiplegia associated with hemianesthesia, homonymous hemianopia, and in many instances aphasia, would indicate that an arterial vessel had been occluded rather than a small vein although the extensive surrounding encephalitis may account for the wide spread of signs and symptoms.

The middle cerebral artery is the largest branch of the internal carotid artery and is more nearly a continuation of the internal carotid than any other branch. A piece of septic material free in the blood of the internal carotid artery *should* lodge in the middle cerebral artery more frequently than in other branches in the same manner that a foreign body is more often found in the right than in the left bronchus. A metastatic abscess, especially if it is single, is found in the parietal region more often than in any other part of the brain and this area is supplied by the middle cerebral artery. The next most common site is the frontal lobe which is supplied by the anterior cerebral artery. A metastatic abscess in the cerebellum is a very rare condition. Therefore, if the lesion is due to a venous embolic process, as was formerly claimed by Eagleton, it would seem that involvement of the cerebellum would occur more often. Eagleton stated that the vast majority of, if not all, metastatic abscesses are undoubtedly of venous origin, but he fails to prove it.

Atkinson[2] described similar pathology in one case (Case 9). Eagleton[7] later stated that most of these abscesses are due to arterial involvement while some are of venous origin. It is more likely that, in those cases in which the onset is insidious, the infection reaches the brain by the venous route. The marked definition of the middle cerebral artery and its branches shown by thorotrast is suggestive.

At the site of the lodged septic material, an exudation of leukocytes takes place, the brain tissue becomes degenerated and pus forms. There is at first a *small* area of pus, beyond and adjacent to which is a zone of disintegrated and partially liquefied white substance, and beyond this a zone of encephalitis, with marked

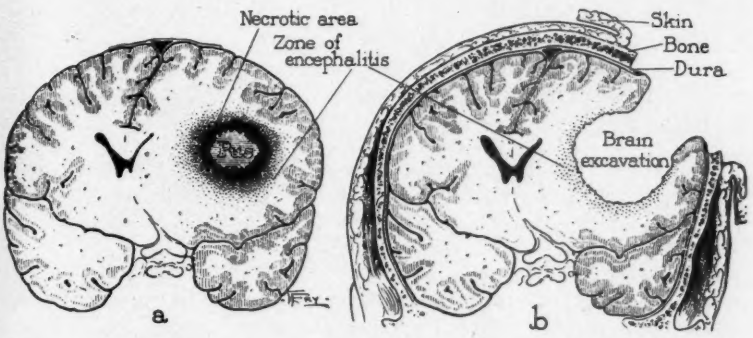

Fig. 1. *a.* Solitary acute metastatic brain abscess about the sixth or seventh day. Suppurative and necrotic areas in white substance surrounded by a zone of edematous encephalitis. Marked increase in size of affected hemisphere with ventricular compression and displacement.

b. Shows relative size of openings in skull, dura and cortex, and relative amount of cortex and involved brain removed. Iodoform gauze is used in same manner as with encapsulated abscesses.

edema (Fig. 1a). There is intense swelling of the brain. All specimens show that the involved hemisphere is very much larger than its opposite. The infective encephalitis spreads rapidly and extends toward the ventricle rather than toward the cortex. A protective barrier is not likely to form, especially in cases in which the lesion is secondary to pleuro-pulmonary disease. On the contrary the ventricle is soon involved and meningitis by this route, terminating in death, ensues. In most cases, death has occurred within twenty-one days, and often within ten to fourteen days. In some instances the patient has sufficient reparative power to effect a walling-off of the involved area in the brain. Should this occur, the abscess is usually large, more centrally placed, closely encroaches upon the ventricle, and ruptures early into it. If drainage is effected before rupture occurs, the intervening substance between the abscess cavity and the

ventricle may be so thin as to be translucent. Grave danger of the ventricle rupturing into the abscess cavity due to the oncoming increase of intraventricular fluid after operation is great. Such an instance has been observed by the writer and similar cases have been reported by Woltman and Gardner.[10] Prevention of this catastrophe can only be done by early lumbar punctures with removal of a large amount of cerebrospinal fluid, and this may not be successful.

Time for Operation

Since these patients will usually die from rapid and early invasion of the ventricle, operation should not be deferred longer than the sixth or seventh day. By this time definite pus will be found, rupture into the ventricle can most likely be prevented, and a less amount of brain substance will be destroyed. The findings of all investigators point to these facts. Roulland operated early in his successful case. Eagleton concurs in this opinion.

Release of the enormous edema of the brain can be effected. Further marked destruction of the brain tissue involved in the encephalitic process can be checked.

Ventricular rupture with its ensuing meningitis is the cause of death relatively more frequently in encapsulated metastatic abscesses than in encapsulated abscesses of other origin, and was the cause of death in two of my cases, although the abscess had been drained adequately. The intervening tissue between the abscess cavity and the ventricle is frequently so thin that any kind of pressure by gauze or tube, or change in the hydrodynamics of the brain will produce a leak into the ventricle by solution of this thin intervening membrane.

For all of these reasons, early operation is earnestly advised, with preference for the sixth or seventh day after onset of symptoms. By so doing one will encounter pus (and therefore is justified in the attack), and at the same time will lessen the likelihood of extension of the infection into the ventricle.

Anesthesia

Local anesthetic is the one of choice. The patient is probably not very stuporous or comatose and the area to be anesthetised is small. Procaine with epinephrine 1 per cent for the scalp and 0.5 per cent for the soft parts beneath the scalp gives excellent anesthesia. When the patient is conscious, he is cooperative and is not moving the head as is frequently the case when avertin is used. In these cases

inhalation anesthesia of any kind is contraindicated on account of the pulmonary lesion, and ether especially should not be used.

Furthermore, on account of marked expectoration, a general anesthetic would be contraindicated. Rather than diminish the patient's efforts to get rid of the putrid material in his lung, it should be encouraged. Under local anesthesia, the coughing reflex is not abolished. The patient may cough up a considerable amount of sputum during the operation. At this point one should speak a word of caution regarding too violent coughing after the cortex has been incised. Should this not be guarded against, a sudden and fatal prolapse or extrusion of the softened brain may occur. Epinephrine in the solution is markedly hemostatic in its action, and is especially valuable in controlling the otherwise rather free oozing from the scalp overlying an acute process in the brain.

Operative Procedure

In many respects the indications to be met are similar, whether the lesion is of metastatic or otogenic origin, or otherwise. There is always a large area of acute encephalitis in *acute* cases with marked edema and swelling of the brain. This will also be found in chronic cases with pericapsular brain necrosis, in those instances in which there has been a sudden extension of the abscess, and in those cases at which an unsuccessful attempt at drainage has been made.

On the other hand, there is never a definite, firm, limiting wall or so-called capsule, which can be utilized in the operative procedure. In order to have the patient recover, or recover as he should without repeated operations, one must guard against the following:

1. Meningitis spreading into the subarachnoid and subdural spaces at the site of the dural opening.

2. Meningitis from spreading infection into the ventricles, or rupture of the abscess into the ventricle, either at the time of operation or subsequently.

3. Extension of the acute encephalitis farther into the substance of the brain due either to propelling of the brain substance against drainage tubes by coughing, crying, or other forces, or failure to provide for *sufficient* and *efficient* drainage.

4. Formation of secondary abscess pockets.

The procedure described will, in my opinion, offer the greatest chances of recovery.

A straight incision about 3 inches long is made in the scalp directly over the suspected involved region of the brain. It is begun in the upper temporal region, and is extended upward and forward, in cases of frontal bone involvement, almost directly upward in that of the parietal lobe, and upward and backward in the event that the occipital lobe is involved. Should the temporal lobe be the site of the abscess, the incision is carried downward. Statistics show that the lobes most frequently involved are in the following order: parietal, frontal, frontoparietal, parieto-occipital, and occipital. The incision is carried down to the outer table of the skull and the pericranium is stripped off to allow inspection of the skull. If the suppurative area is sufficiently close to the surface to permit of its being dealt with surgically, the outer table of the skull lying directly over the process will invariably have a *yellowish* appearance, not unlike the horn handle of a Barlow knife. This yellowish area of the skull is directly over the lesion (found in all four cases). It is somewhat circular in shape, with the center of deeper color, shading out gradually into bone of normal color. This area observed in the four cases was about 2½ inches in diameter. Should a small incision about ¾ or 1 inch long be made, as is usually done for a definite chronic brain abscess secondary to diseases of the mastoid, middle ear or accessory sinuses, the involved area of the skull may not be seen. Therefore, the longer incision suggested above should be made. Once the central portion of the yellowish zone has been seen, a lateral counter-incision about 1 inch long is made into either flap at opposing points over the center of the zone so that four flaps are formed as in a crucial incision. The scalp flaps are held apart with self-retaining retractors. These expose adequately the area of skull and prevent bleeding from the scalp margins which otherwise would be free and troublesome.

The central portion of the yellowish zone on the skull is selected for the trephine opening. The dura will be found to be tense and non-pulsating. Although some discoloration may be observed, it usually appears clear and thinned out. It is not adherent to the cortex. It is justifiable to insert a brain cannula in a perpendicular manner to a depth of about 1.5 to 2.0 cm. and aspirate material for culture. A small crucial nick is made in the dura, the cortex will bulge into it, and when the puncture is made, infection will not extend into the meninges. The material obtained by aspiration may be frank pus or broken-down necrotic brain substance. It may or may not ooze through the cannula of its own force without aspiration. The cannula tip, as it passes through the cortex, meets with the same resistance as when passed through normal cortex, but beneath the cortex the resistance is somewhat diminished. A depth

of about 2 cm. has been sufficient to obtain necrotic material. The lesion is always *subcortical* in the *white* matter.

It is important to emphasize that multiple punctures should not be made. No abscess wall is present, and no increased resistance will be met if the diagnosis is correct, unless the tip of the cannula strikes a blood vessel. Therefore, not only is it useless to make more than one careful puncture, but there is grave danger of carrying the infected material into other directions and involve other areas, in which a second abscess or suppurative lesion may develop after the original one has been adequately dealt with. Multiple and deep punctures in various directions are to be strongly condemned.

Actually it is not necessary to make a puncture at this time. Should it be done, the small opening in the dura should be well coagulated to prevent possible spread of infection beneath the dura. The opening in the bone should be enlarged until it is circular in shape, about 2 inches in diameter, and in the directions in which the skull is most yellow. The skull is softened, and cuts readily with burr and rongeur. Should the yellow area be smaller than 2 inches in diameter, and it is necessary to remove more bone in order to create a defect of the proper size, the relative density of the bone will be recognized at once. (This softening is not due to osteomyelitis, but probably to calcium absorption from the underlying adjacent infection as is often observed in the skull overlying a chronic, well-encapsulated abscess.) The margins of the cranial defect are smoothed off with rongeurs in order to remove little points and spicules. Although this can be more readily done with osteotome and mallet, as in cranioplasty, a mallet should not be used on account of the blows and shock. (This was emphasized by Macewen.) All small pieces of bone fragments should be removed, especially those which may be shoved under the inner table of the skull. The dura is opened and incised in a radial manner to within a quarter of an inch of the bone margin, and the flaps are cut away leaving a dural defect, circular in shape, about 1½ inches in diameter, within the cranial defect. Only the cut *edge* of the dura is sealed to the cortex by electrocoagulation, otherwise the damaged dura may slough and prolong infection. Four short strips of half-inch iodoform gauze are placed in a circumferential manner to cover the edge of the dura and the site of its fixation to the cortex, as well as the margin of the cranial defect. Shortly, blood will ooze into the pieces of iodoform gauze, will coagulate, and they will become well fixed over the dural and cranial margins. The gauze will control oozing from the bone margin and serve as a mechanical barrier to infection. It is believed it will lessen the chances of infecting the subdural space

and diplöe. Bone wax should not be used to control oozing or bleeding from the bone margin. Its presence may cause late infection of the wound. Iodoform gauze strips are sufficient.

The cortex will bulge slightly into the dural opening; but this is not marked. It is not necessary to fix further the cortex to the dura by catgut sutures; it does not sag away from the dura. The surface will appear somewhat reddened and injected, but otherwise may be normal in appearance.

On palpation a definite feeling of softening will be elicited due to the necrotic and suppurative process in the white matter, but not in the gray matter. It is only a transmitted "feeling" of softening.

The veins of the cortex are sealed off about and just within the dural defect. An incision is made through the cortex over the area of softening, or at the site of puncture, in the event that one has been made. When the white matter is entered, it will present a yellowish appearance which deepens in intensity as one approaches the central area of necrosis where actual pus will be found. The amount of pus is not large, usually about 4 to 10 c.c. depending upon whether the patient is operated upon on or about the seventh day after the onset of symptoms or later.

The overlying cortex is removed by the electrosurgical cutting point and suction, the opening created in the cortex being just smaller than that in the dura. The various coverings of the structures over the suppurative focus, scalp with its adjacent soft parts, skull, dura and cortex are thus "terraced." As the superficial yellow-tinted white matter is being removed by suction, it will be observed that it becomes more necrotic and broken-down in appearance as progress is made toward the actual pus. There is no definite demarcation in the change from less to more involved brain substance. No vestige of a wall or capsule will be found macroscopically.

After removal of the pus by suction, the excavation in the white substance of the brain is enlarged inwards toward the ventricle, and circumferentially in all directions until all of the necrotic brain substance and some of the surrounding tissue involved in the encephalitic process are removed. (Fig. 1-b.) The resulting "excavation" will resemble a short, squatty ink bottle in shape, the opening in the cortex corresponding to the mouth, and the subcortical portion to the main portion of the bottle. The opening is about 1 to 1¼ inches in diameter, while the central subcortical portion is about 1½ to 1¾ inches in diameter. As the white substance beyond the central, suppurative "core" is removed, it becomes firmer and less yellow in color, showing the same changes observed when approaching the

pus from the cortex, but in reverse. Exactly how much of the surrounding zone of brain tissue involved in the encephalitic process should be removed cannot be stated definitely. The first consideration, after removal of the actual pus, is not to enter the ventricle. The amount of infected brain substance which can be removed without entering the ventricle is rather surprising. One must remember, however, that the involved cerebral hemisphere is much larger than its opposite. The ventricle has not been entered in any of the four cases. Removal of inflamed edematous tissue of white matter far beyond the actual central suppurative core is unnecessary. This tissue will recover if adequately and properly drained after the pus and necrotic material are removed. The tissue forming the wall or limits of the excavation will still have a faintly yellow tinge even when the created cavity is 1½ inches or 1¾ inches in diameter.

In the process of removal of the necrotic or semi-necrotic brain substance, should blood vessels be seen, they should be pushed aside, especially if arterial, and not ligated or divided. Otherwise more brain damage would ensue by further deprivation of blood supply. The actual site of the infected embolus or thrombosis in the vessel has never been seen probably due to the fact that it has been destroyed in the suppuration.

The operation is now completed except for the drainage material. It may be surprising, to some at least, to know that the cortex does not tend to fall away from the dura, nor does the excavation suddenly tend to collapse, as frequently follows evacuation of an encapsulated abscess deeply situated in the frontal lobe. It is assumed that the lack of collapse of the artificially created cavity is due probably to two main factors: first, the intraventricular pressure is not so great as in an encapsulated abscess with sufficient pericapsular edema and encephalitis as to bring the patient to operation; and, second, surrounding edema of the brain substance is lessened by the excessive fluid content of the tissues exuding from the brain substance during the time of making the excavation. However this may be, the fact remains that it does not collapse.

A "handkerchief" of two layers of iodoform gauze about 6 inches square is used to line the excavation. The central portion is picked up, the hand is drawn down over it from the center, and it is fashioned into a long pointed cone. The pointed end of the cone is inserted into the excavation and carried to the bottom of it. Care must be taken in the introduction not to thrust it through the remaining interval of brain substance into the ventricle. The cone is then opened and strips of soft, fluffy iodoform gauze are packed snugly inside the handkerchief of gauze so as to bring its surface fairly

firmly against the walls of the excavation. This gradual introduction of gauze strips is continued until the two layers of the original piece of iodoform gauze press against the walls of the excavation in the white substance of the brain, against the cut edges of the cortex, up to the dural margins, and the redundant corners are folded over the inner strips of packing.

This makes a mass of iodoform gauze with a smooth conforming surface which fits snugly against all raw surfaces of the brain substance which have been exposed. The mass somewhat resembles a doorknob in shape, wider than thick, and it will not be suddenly dislodged. In its position it remains for the same mechanical reasons that a monkey cannot get his fist out of a hole in a coconut. In order to remove this mass, the gauze strips in the center must first be removed.

The self-retaining retractors are removed and major bleeding points, if any, are coagulated. Fluffed iodoform gauze is loosely stuffed beneath the four scalp flaps with the end of a Dakin tube inserted beneath it, if irrigation of the area is to be done. The scalp flaps are laid over the mass of iodoform gauze in the wound and are loosely held with bridge sutures to keep the gauze and flaps in position. A copious gauze dressing wet in azochloramid or Dakin solution is applied and held firmly in place with bandages and adhesive strips which include the lower jaw.

Why is this operation advised?

Adequate drainage is effected. Cohen[5] states that the drainage must be adequate and says: "To promote adequate aeration, instead of drainage by a small tube, a relatively large opening of the abscess and *free* drainage are advocated." He calls attention to the fact that in many cases infection is caused by, or at least marked by the presence of anærobic bacteria. Since oxygenation of the area cannot be successfully done through rubber tubes, he also is an advocate of wide open drainage. Heretofore most writers have spoken of the futility of so-called drainage of an acute suppurative process in the brain. This is quite true when a small opening is made in the skull and dura and a drainage tube is inserted. It would be difficult to determine without seeing whether the tube was actually in the suppurative focus or not. The small or large tubes would become plugged, and the pent-up edema cannot escape, at least not as rapidly as it forms.

When the mass of iodoform gauze is formed and placed as described the following advantages are derived:

a. A rather large dural exit is provided.

b. The major portion of the brain substance involved in the encephalitic process including all of the suppurative and necrotic area, is removed.

c. With the bottle-shaped cavity in the brain substance a considerable area of raw brain tissue surface is created which allows the excessive aqueous content (edema) of the brain to ooze into and through the iodoform gauze. With the subsequent ventricular dilatation which always ensues, the brain substance is brought gradually and with increasing pressure against the gauze so that the edema is literally squeezed out of the brain tissue.

d. Iodoform gauze is used instead of other material for the following reasons in addition to those stated above. It remains clean and "sweet" longer than any other gauze known to me except that moistened in azochloramid in triacetin. It is not displaced as readily as is azochloramid oil dressing and absorbs water much more readily. The shape of the mass prevents displacement. The rounded contour of the mass against the brain substance prevents laceration or digging into the raw brain substance, which occurs if *thick* strips of gauze or any other substance are placed against the brain tissue. This rounded, flattened mass produces less trauma during coughing and crying. In so many of these cases severe paroxysms of coughing are most outstanding. Where aphasia and the usual hemiplegia or hemiparesis are present, patients are likely to become depressed and cry. These actions violently increase intracranial pressure, and thrust the exposed brain tissue against whatever type of drainage material is placed into the excavation. The flattened and rounded base of smooth iodoform gauze buffers the brain substance better than any other material known to me. It has the same effect when postural drainage is used. A rubber balloon might be softer, but it has its disadvantages.

e. Eventually, when slow, controlled herniation of the floor of the excavation to the level of the dura is desired, this can be accomplished by slow removal of the gauze strips constituting the inner portion of the mass. When the last two layers of gauze are slowly removed with peroxide, the brain surface inside the excavation, which was yellowish in tint, and very soft and friable at the time of introduction of the gauze, has now become pinkish and granular in appearance, and firm. It becomes definitely fibrosed and will resist pressure made by the finger tip or a blunt instrument, and will not tear readily.

f. Other usual forms of drainage materials have not been used or are not advocated for various reasons, some quite obvious. Rubber

tubes would not prevent collapse of the cavity and would perforate the ventricle like a bayonet when the patient coughed or during the oncoming dilatation of the ventricle. Rubber dam or pieces of rubber dam or tissue would not prevent collapse of the excavation during the reparative period, or produce a firm brain surface as does iodoform gauze. Furthermore, they are very slippery and do not remain in position when the dressings are done. Vaseline gauze, though soft and pliable, and conforming well, is not so absorptive.

I know no disadvantages or contraindications to the proper use of iodoform gauze. Some may raise the objection that it sticks to the brain surface, that it will tear the brain in its removal, and that re-infection of the white matter will ensue. This would surely be the case were the gauze jerked off, or removed violently or carelessly. Such a thing will not occur however, if the last two layers of gauze are removed slowly (taking half an hour or more to do it) with the aid of hydrogen peroxide solution in loosening it.

Some may claim that the mere opening up and exposure of so much raw brain surface would only invite extension of infection into the brain tissue. Such is not the case except when the brain is further traumatized by introduction of hard drainage materials. The grave dangers are meningitis, either by spreading directly into the meninges, at the site of the dural opening, or rupture into the ventricle, and the possible debilitated condition due to coexisting pulmonary involvement. The mere temporary presence of bacteria on the raw surface of brain is of no consequence once leakage into the meninges and rupture into the ventricle are prevented.

Postoperative Management and Progress

In view of the fact that the patient usually has a suppurative pulmonary condition coexistent with that of the brain, the use of a bactericidal solution by instillation through the tube should not be so vigorous as in the ordinary case of brain abscess. When the dressing is kept excessively wet, the patient's shirt and bed clothes are likely to get wet at times, even with the most careful precautions. Such conditions would probably aggravate the pulmonary focus, and might help to induce a supra-imposed pneumonia. The chlorine atmosphere, which is of no consequence in the ordinary uncomplicated case of brain abscess, irritates the lungs and is likely to provoke or increase coughing. Coughing and the pulmonary condition with the associated debilitated state of the patient are the greatest drawbacks to a successful result.

It is advised that azochloramid oil be used to moisten the dressing by instilling through the small rubber tube in cases where there

is much coughing and where the pulmonary condition is rather severe; 25 c.c. a day will be sufficient. This oil is a strong bactericide, and does not injure the tissues. The scalp should be protected with vaseline gauze.

Azochloramid solution and Dakin solution are probably equally efficacious in combating infection in the wound, and one should be used in the ordinary case. When superficial sloughs of the brain, cortical margins and dural margins take place (and they frequently do in some degree), Dakin solution removes the sloughs better than azochloramid solution and should be used. The opinion held by some that either of these solutions is damaging to the brain tissue when so used is fallacious.

The superficial dressing is removed on the second day, and the bridge-sutures are removed for the reason that they are no longer needed to hold the gauze or flaps in position. The iodoform gauze beneath the flaps and within the drain are not disturbed. The entire head is covered with large pieces of vaseline gauze for protection of the scalp, and a copious gauze dressing wet in one of the solutions mentioned is applied and held firmly with bandages and multiple pieces of adhesive placed in several meridians around the head with the lower jaw included. It should fit as well and snugly as a football helmet, and should be applied by the operator. It is most essential that the dressing does not shift in position, and that it cannot be removed by the patient. The relative position of the pieces of gauze about the wound should be maintained. The protective strips of vaseline gauze aid in maintaining fixation of the dressing.

The patient fares better in a semi-sitting position, unless unconscious. With the snugly fitting dressing in place, postural drainage can be regularly instituted. Should irrigation of the bronchiectatic or abscess cavity be necessary, it can be done, but such a procedure should be deferred for at least a week or ten days if possible in order to allow establishment of a firmer surface of the brain substance in the excavation against the iodoform gauze.

Sodium phenobarbital, gr. 1½, is given hypodermatically for restlessness which accompanies increased dilatation of the ventricles with its ensuing increase of intracranial pressure during the first forty-eight hours. The semi-sitting position will also mitigate excessive filling of the ventricles. Hypertonic glucose solution (100 c.c. of a 35 per cent solution) given intravenously twice a day will effectively reduce the intracranial pressure.

After forty-eight hours lumbar puncture can be done safely. By this time the cortex is well fixed to the dura, and there is very little

likelihood of having meningitis develop by tearing away these adhesions or rupture into the ventricle. The removal of 20 to 30 c.c. of cerebrospinal fluid will suffice. This can be repeated thereafter as often as it may be considered advisable.

A daily enema is given after forty-eight hours as well as a mild saline laxative. Constipation should not be allowed nor severe straining be induced.

Dressings are done by the operator daily or every other day for ten days without disturbing the iodoform gauze beneath the flaps. To the curious-minded there may be an inclination to do so earlier, but this would be meddling.

By the tenth day the fibrosis of the brain substance about the iodoform gauze mass will have become sufficient to allow slow removal of the gauze at successive dressings. The gauze which has been placed beneath the flaps is first removed, followed by removal of the four narrow pieces of gauze about the dural and bony margins. The bone edge will have become covered, or almost covered, with granulations. The most superficial piece of gauze within the handkerchief is removed and not replaced. Slow outward progress of the bottom, or floor, of the excavation is now desired. Lumbar punctures are withheld. On the thirteenth or fourteenth day the last piece of original iodoform gauze handkerchief is slowly removed; not from deep within the cavity, but from the brain surface, for the reason that the floor of the cavity or excavation has reached the level of the dura or skull. It requires about a half hour for removal of this last piece, and it can be done best by using a considerable amount of solution of hydrogen peroxide to loosen it, moving about from one place to another and wiggling the gauze away with the soft nose of a small rubber bulb ear syringe.

It would be disastrous to remove the gauze rapidly. The surface of the brain would surely be torn, and the protective, fibrosed surface formed by prolonged contact with the iodoform gauze would be lost. (In chronic encapsulated abscess the gauze is removed much sooner and elevation or herniation of the floor of the cavity to the level of the skull is allowed much earlier. Furthermore, the gauze does not adhere so firmly and can be removed more readily.)

A piece of gauze wet in Dakin solution or azochloramid solution is placed against the brain surface, the end of the instilling tube is placed over it, and the two are covered with a piece of rubber dam beneath the scalp flaps. The usual outer dressing is applied, and the area is kept wet.

From this time, the area is dressed in a manner similar to that used in the ordinary case of cerebral abscess. The scalp flaps are allowed to become attached to the margins of the brain surface. They are kept well shaved to prevent irritation of the adjacent brain surface by ends of hairs sticking into it. Epithelialization takes place and the area heals. The spread of epithelium is facilitated by the use of perforated strips of adhesive. A wet dressing is applied over the strips of adhesive, but repeated instillation is not necessary. Should progress be satisfactory, the wound is completely healed by the fortieth or forty-fifth day.

The surface of the brain should be maintained at or about the level of the skull. This can be done by use of the following:

1. Forcing or withholding fluids.

2. Position of the head of the patient. If less elevation is desired, semi-sitting position should be maintained. If more is desired, the head should be lowered.

3. Saline laxatives diminish the elevation of the brain surface, while withholding them increases the elevation.

4. Lumbar puncture will diminish the elevation of the brain surface, or the size of the hernia cerebri (should it exist) immediately, after a few cubic centimeters of fluid have escaped through the needle. If too much fluid is removed, the area will become depressed, sunken and concave, and the patient will have headache. It is to be remembered that subsidence or depression of the surface continues to some degree after the needle has been removed.

A marked tenseness of the granulating brain area or hernia cerebri on the following day after lumbar puncture has been done, and this in spite of the fact that the semi-sitting position has been maintained, laxatives and enema have been given, and fluids have not been forced, indicates that another brain abscess is present, i. e. the lesion is multiple, and not single, as was believed at the time of operation.

The temperature should recede to normal, or almost normal, after the first four or five days, unless it is affected by the concurrent pulmonary condition or some other focus.

Nursing

It may seem superfluous to speak of the nursing care in these cases. Nevertheless the successful outcome may depend to a very large degree upon the hearty cooperation of a diligent, intelligent and painstaking nurse, and especially one who has previously had

experience with these cases. The dressings are tedious and long, and require many things which must be prepared by the nurse. Instillation of Dakin's solution should be done hourly. The skin of the back, neck, shoulders, ears and face must be carefully protected to prevent irritation and burns. The patient's clothing and the bed clothes should be kept dry. Otherwise the pulmonary condition which may be coexistent in a number of these cases might be aggravated. Careful feeding by the nurse, especially of stuporous patients, must be done so that insufflation of materials into the lungs will not occur. Postural drainage may have to be carried out, and this requires an alert and intelligent nurse. As has already been stated, proper attention must be given the bowels and the patient should be lifted on the bed pan. Particular care of the skin in incontinent patients to prevent bedsores should be taken, and proper supervision of tidal bladder drainage has to be carried out. It is most essential that a slightly delirious patient be prevented from removing or disarranging his dressings. These patients are also inclined to stick their fingers underneath the dressings. This must be prevented.

It has been my experience, that the results in cases of brain abscess in general have been so much better with patients who have had the advantage of careful nursing than with those whose nursing was but casual. One patient was actually kept alive by, and his recovery was due to, the absolute vigilance and constant attention given by two nurses. This was a case in which there was a rather large opening in the anterior horn of the right ventricle, from which there was enormous ventricular leakage. The dressing was left off completely, and the nurses played a constant drip of Dakin solution on the wound at the site of the opening in the ventricle.

Report of Cases

Six cases of metastatic cerebral abscess (five in Bellevue Hospital) have been operated upon; four acute, and two chronic, with definite, well-defined wall. In one of the acute cases, the left hemisphere was the site of multiple abscesses. Although this patient lived twenty days following operation, he died, as might have been expected. One patient had practically recovered, the operative wound was almost healed, when operation was performed for drainage of an abscess of the lung twenty-five days following the operation for brain abscess. The patient died six days after drainage of the pulmonary abscess from extensive suppurative pulmonitis. The manner in which the operative area in the brain responded would lead one to believe that the lesion was single. Autopsy was not done.

The causes of death in the third case probably were improper dressings and improper nursing. The patient although hemiplegic, succeeded in removing the dressings on several occasions and lacerated the brain surface with his finger nails. Azochloramid oil was used instead of iodoform gauze packings. The patient was in a very debilitated condition due both to pulmonary and cerebral involvement. Autopsy permission was not granted; it was not known whether the abscess was single or multiple. A complete report of these cases will be made in a subsequent paper.

A detailed report of a case which recovered will be given. The report necessarily must be laconic on account of its length.

CASE 3. *Acute Metastatic Brain Abscess of Left Parietal Lobe Secondary to Lung Abscess in Right Lower Lobe. Duration Seven Days. Operation. Recovery.* A surgeon, 36 years of age, was admitted to the Manhattan Eye, Ear and Throat Hospital on November 2, 1933. The following history was obtained at U. S. Marine Hospital, Stapleton, Staten Island, N. Y., where he had been admitted at 3:30 a. m. on October 30, having as his chief complaints severe headache, cough, and prostration.

He had had a severe cold for about two weeks and a cough for several days. Expectoration was profuse with occasional blood-streaked sputum of foul odor. Severe headache, sudden in onset, for the previous three or four days had been almost continuous. He had suffered from migraine for the past five years. He had been able to drive his car during the day of October 29. At 3:00 a. m., October 30, he had a chilly sensation with violent exacerbation of headache, defect in speech (anomia) and sensory disturbance in the right arm. He was in great distress from headache and complained of marked weakness. Examination of the chest showed impaired resonance on the right side, front and back. Numerous bubbling rales were heard as high as the third rib in front and midscapular region in back.

Radiographic examination of the chest with the bedside unit showed a shadow of increased density about 2 inches in length and 1 inch in width in the right lower lobe near the right lower bronchus with marked elevation of the right side of the diaphragm, moderate prominence of the right hilus shadow giving the appearance of an early pneumonia. Five hours later the shadow in the right lower lobe appeared to be somewhat larger, with its superior border not sharply demarcated. This was considered pneumonia, although later it proved to be lung abscess.

The white cell count was 21,500 with 90 per cent neutrophils.

On the afternoon of October 30, he was examined by Dr. S. Bernard Wortis, who made the following notes:

"History: Foul-smelling sputum one week before onset. X-rays now show consolidation of the lower lobe of the right lung. Had sudden onset of headache, and vomited several days ago. He now has severe headache and projectile vomiting.

"Neurologic findings: Fundi show slightly engorged veins. Right lower facial weakness. Weakness of the right arm and right leg, less in the leg. Distinct anomia. Perseveration. No sensory aphasic defect noted. Diminu-

tion of right biceps; right abdominals absent. Suggestive right Babinski response. Pupils react to light and accommodation. Extraocular muscles normal. Diminution in vibratory sense over right arm, and less of right leg. Findings point to metastatic septic thrombosis (or pre-abscess) of left temporal lobe."

The temperature was 102°, pulse 115, and respiration 24.

The patient had received 100 c.c. of 50 per cent glucose solution three times a day. At times he was apparently in touch with his environment, recognized his friends and responded promptly by head movements to questions. At other times he lapsed into lethargy and no contact could be made with him.

On October 31, the white cell count was 19,500, with 93 per cent neutrophils. Temperature during the day declined to 100° and the pulse to 80.

On November 1, the white cell count was 16,000 with 92 per cent neutrophils. His temperature rose to 102°, pulse to 120 and was very irregular. Dr. Wortis saw him again that day and made the following note:

"The patient has the same signs as noted above. The white cell count and temperature remain high. There is recurrent lethargy with interspersed periods of lucidity. Motor aphasia still present. Right hemiplegia marked, and right abdominal reflex is absent. Right Babinski. Neck sensitiveness less. No Kernig. Findings still point to deep temporal abscess, left." He suggested that the patient be placed under my care.

On Nov. 2, the white cell count was 11,500 with 86 per cent neutrophils. Temperature 101°, pulse 70, respiration 24.

He was transferred to Manhattan Eye, Ear and Throat Hospital in an ambulance. Radiographic films of the skull showed only mild involvement of the frontal sinuses, ethmoids, antra and sphenoids. Sputum revealed presence of many pus cells and very many gram-positive diplococci, but no tubercle bacilli. Examination was repeated by Dr. Foster Kennedy and Dr. Wortis.

Dr. Kennedy corroborated the findings of Dr. Wortis and not only advised but insisted upon operation. I questioned the advisability of performing the operation before sufficient time had elapsed for encapsulation, but was overruled. The patient was operated upon in the late afternoon of November 3, under local anesthesia, seven days after the initial headache and four and a half days after the first neurologic symptoms appeared.

Operation Report: *Pathology*: The symptoms including right hemianesthesia, right hemiplegia, right homonymous hemianopia, and aphasia indicated that the lesion was rather wide spread. This proved to be the case. Through an opening made with a burr over the mid-motor area the dura tended to bulge, but did not pulsate. It was not discolored. The skull was rather soft and cut readily with the burr. The outer table was somewhat yellowish in appearance. No resistance was offered to the tip of the exploring cannula except that by a blood vessel. After a slight rotary motion of the cannula some grumous material, some of which was dark in color, extruded itself alongside the cannula. Upon enlarging the opening in the bone and dura, there was no escape of cerebrospinal fluid. The cortex protruded somewhat through the dural opening. Its surface was injected, slightly reddened, and the convolutions were somewhat flattened. Palpation revealed there was softening beneath it, although the cortex itself appeared to be fairly firm. The firmness of the cortex

was more appreciated after some of it had been removed. The suppurative process was in its usual position, i. e. subcortical, in the white substance The cortex itself was not involved in the suppurative or necrotic process. At a depth of about 0.5 cm. the white matter appeared yellowish and became increasingly so as the brain substance was removed by suction. Deeper the brain tissue was necrotic and characteristic in appearance. It was more yellow than the immediate subcortical brain substance. At a depth of about 2 cm. actual pus, about 12 c.c., was encountered. Specimen of the necrotic brain material and pus was sent to the laboratory for examination. The central suppurative area

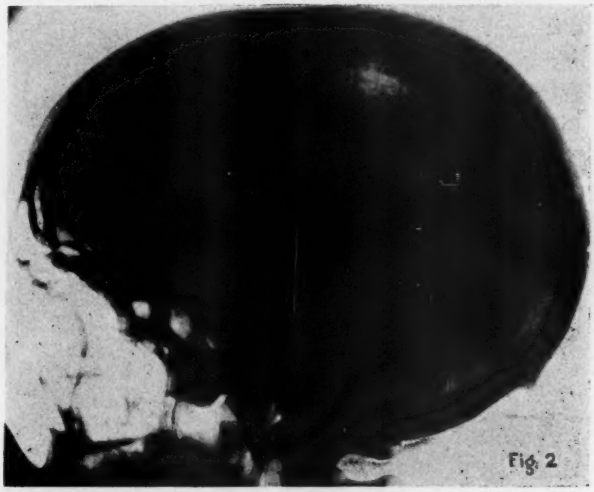

Fig. 2. Lateral roentgenogram showing size and position of the cranial defect following operation for acute metastatic brain abscess of parietal lobe. This and the following illustrations are from the case reported in text.

which contained actual pus was about 2 cm. in diameter and of an irregular spheroid shape. There was no evidence whatsoever of a limiting membrane. Beyond the purulent area, as the excavation in the brain was enlarged, the white substance was found to be involved in the reverse direction. The brain substance adjacent to the purulent area was actually necrotic, partly liquefied and broken down, and beyond this the area extended into one of encephalitis which became less and less marked with the depth of the excavation. The following is taken from the operative report:

"The whole purulent and necrotic area was comparable to a nebula in the heavens, i. e., the central portion was more involved and concentrated in its purulent liquefaction, and as one progressed from the central part of the purulent area in any and all directions, the necrotic and suppurative area became less marked until the brain substance appeared only slightly yellow but with marked edema."

Procedure: Through a three inch vertical incision a trephine opening was made with a Hudson bone drill in the mid-motor area of the left side, and after it was enlarged in a circular manner to two inches in diameter (Fig. 2),

the dura was incised in a radial manner, and the dural flaps were removed, leaving a dural defect about 4 cm. in diameter. The dural margin was sealed to the cortex by electrocoagulation. Strips of iodoform gauze were placed about the cranial and dural defect, and these became adherent at these sites. The condition described above was found. In removal of the necrotic and purulent area, the first consideration was not to enter the ventricle, and the second was removal of the greater portion of the infected area in the brain substance. The resulting excavation after removal of this substance might be described

Fig. 3. Appearance of wound on eleventh postoperative day. Iodoform gauze has been removed leaving firm brain surface which is on the level of the scalp. Scalp edges adherent to brain substance and margins of skull defect.

as follows: It was shaped like a short squatty ink bottle. The opening in the cortex was about 3 cm. in diameter. The cortex did not tend in the least to fall away or sag from the dura. Once the overlying cortex was removed, the excavation was limited to the white substance. The diameter of the cavity was 5 cm., and its width was greater than its depth. The wall of the artificially created cavity had no limiting membrane whatsoever. Its surface was slightly yellowish in color throughout and did not have the normal appearance of white substance at the completion of the operation, as was noted in the case of L. N. 14. It was considered advisable to cease removal of the white substance at this point to avoid entering the ventricle. It was also unnecessary. It was thought that the edematous encephalitic process which existed in the white substance, but which was not involved in the necrotic or suppurative condition would be eliminated.

A handkerchief of iodoform gauze consisting of two layers was introduced into the cavity like a Mickulicz tampon. Into this, strips of soft fluffy iodo-

form gauze were inserted until the outer surface of the handkerchief came into intimate contact with the wall of the excavated cavity in the brain substance. The surface of the iodoform gauze packing in contact with the brain substance was soft and would serve as a buffer to prevent tearing of the brain tissue during such actions as coughing, straining, etc. The outer loose corners of the iodoform gauze were stuffed into the bony opening and the scalp flaps were replaced. A copious gauze dressing wet in Dakin solution was applied after the scalp was well greased and covered with vaseline gauze. The dressing included the left ear and lower jaw to prevent displacement. The patient withstood the operation well and left the table in good condition.

Progress Notes: The progress of the patient following operation was as it should be (Fig. 4). The description under "Management" corresponds to his convalescence until the wound was healed. Therefore, the rather full daily notes made following the dressings will not be given. Only the unusual points will be mentioned.

At the second dressing on the fourth postoperative day it was found that the iodoform gauze mass was beginning to extrude itself. The patient was able to say a word or two—"tickle" and "no." No motor return in the right side. On November 6 he said "yes."

Pus from the brain abscess showed no growth on the usual aerobic mediums.

Nov. 9. Sixth postoperative day. All of the iodoform gauze strips within the wound beneath the scalp flaps were removed. The cortical margin had herniated slightly through the dural opening, carrying with it the fluffed gauze in the central portion of the excavation. Slow, outward herniation of the gauze within the brain excavation was encouraged. Hemianopia cleared. Hemianesthesia changed to hemihypesthesia. Temperature 100.2° F., pulse 94, and respiration 24.

Nov. 11. Eighth postoperative day. Some gauze within the handkerchief was removed. Cortical margins about 2.5 cm. above level of the skull. Bone margins covered over with granulations. There is beginning return of motor function in right leg—none in arm. Temperature 99.2° F., pulse 92, and respiration 22. Able to say a few more words—"Well," "I guess so," "all right, "when," "please."

Nov. 11. Note by Dr. J. D. Reichard. "Patient moving toes, ankle and leg on right side. Excursion not great, but all movements present. No movement in arm. Position sense apparently absent in right arm and leg. No quadrantic defect. Right fields seem normal in each eye. Quite emotional. Crying as emotional response to any situation. Seems to understand everything told him even when quite complicated."

Nov. 12. Ninth postoperative day. All the gauze within the excavation was removed with exception of the two layers in apposition to the brain surface. The surface of the herniating cavity was dimpled like an acorn cup. It was about 7 cm. in diameter and about 4 cm. high. The base was firmly adherent to dural and bone margins. There was no evidence of osteomyelitis. The scalp flaps were allowed to fall back against lateral surfaces of the brain hernia in order to become fixed to it. By so doing over-herniation was prevented and blood supply to the brain surface was increased. Words spoken to Dr. Reichard were "you" and "enough."

Nov. 14. Eleventh postoperative day. All of the original gauze was removed. The last portion was adherent to the brain surface. It was slowly removed with aid of hydrogen peroxide solution. There remained a conical shaped depression in the dome of a low hernia about 2 cm. deep. This area had a granular appearance and offered definite resistance to the tip of the gloved finger; about the same resistance as offered by a fairly well established capsule. The surface was somewhat uneven and irregular, as contrasted with the smooth surface of a well walled-off abscess cavity (Fig. 3). The scalp flaps

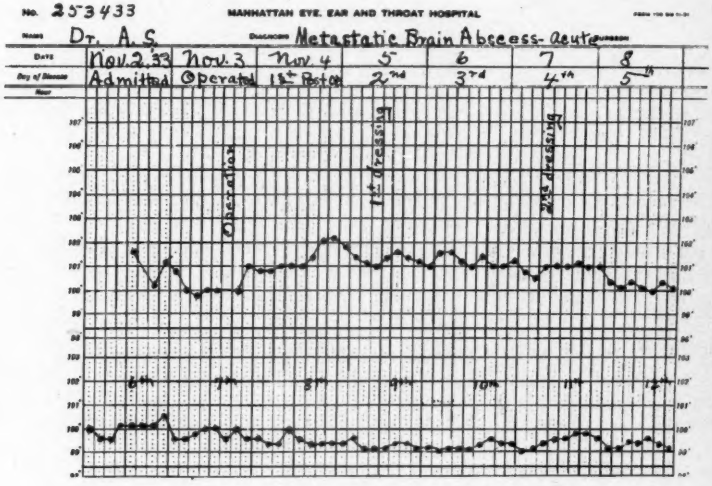

Fig. 4. Postoperative temperature chart for twelve days.

were firmly adherent to the base of the small herniating mass. His general condition was good and he had better use of right leg. He could speak words "Jean," "just fine," "four," "five," "Dakin," "cool," "one," "two." He was actually alert.

Nov. 14. Note by Dr. Wortis: "There is now right lower facial weakness, palsy of the right arm, right Babinski less marked, left plantar flexion. Astereognosis right hand; loss postural sense right arm including fingers, wrist, elbow and shoulder joints. Diminution of vibratory and pin prick of right side of body more marked over arm and thorax. Deep reflexes absent in right arm. Motor aphasia; however, speech is returning. The following improvements noted: Right homonymous hemianopia now cleared. Movements right leg and foot. There is a flicker of right sided abdominals present now. Temperature is down. Progress in neurologic status is very satisfactory. Instruction left for patient to read newspaper fifteen to thirty minutes daily."

Nov. 17. Thirteenth postoperative day. The entire exposed area was swabbed with 12 per cent silver nitrate solution to increase fibrosis. Temperature remains about 99.6° (Fig. 4). Meanwhile aphasia is clearing. Can say "far enough," "I'll tell you," counted from one to twelve, "week's up," "yesterday," "round," "years," "which," "tea with cream, not sugar," "twenty-

five," "egg," "good morning," "crying," "soup," "the other way round," "after a while," "hello," "plenty pain," and "faintly."

Nov. 19. Dr. A. A. Eggston's report on decalcified piece of skull: "Microscopic section of the bone removed from the skull over the region of the abscess reveals granular condition of the trabeculae with very poor staining of the bone cells in the lacunae, which are likewise indefinitely outlined altogether giving the appearance of a granular degeneration of the bony trabeculae and the bone around the blood vessels. The blood vessels are engorged and in some instances show a rather high proportion of leukocytes. Between the trabeculae of bone, the fatty globules in the bone marrow, in most instances, remain intact and show hematopoetic areas with a preponderance of polymorphonuclear leukocytes. In some areas, however, the structure of the fat globules is lost and necrotic degeneration has taken place in the blood forming elements with, however, relatively small amount of polymorphonuclear infil-

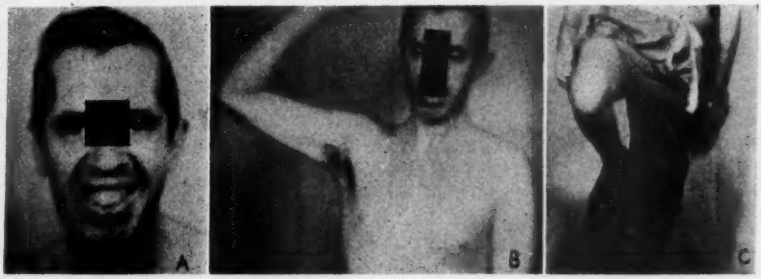

Fig. 5. Enlarged photographs from moving picture film showing the degree of recovery from hemiplegia on the fiftieth day following operation. *a.* Face. *b.* Upper extremity. *c.* Lower extremity.

tration. There is no evidence of new fibrous tissue being formed. Osteoblasts and osteoclasts are absent."

Pathologic Report of Brain Tissue: "Microscopic section of the abscess reveals more or less typical structure in that the more central zone shows necrotic brain tissue, purulent exudate, necrotic fibrin admixed with considerable blood. Extending outward from the center of the abscess is a zone of granulation tissue with dilated new-formed blood vessels and numerous mononuclear and lymphoid cells. In the periphery of the abscess, the brain tissue shows edema with some mononuclear perivascular infiltration. The vessels, as a rule, are dilated. There are isolated areas of hemorrhage and, in some places, definite hemorrhagic infiltration of brain tissue is noted. There is also some breaking down of the red cells with liberation of hemosiderin pigment.

"Pathologic Diagnosis: Acute brain abscess with degenerative changes in the bony vault."

Nov. 21. Eighteenth postoperative day. He was using his right leg well. He now had sensation in most of right hand, but he was still numb in finger tips. He was able to elevate right shoulder and flex forearm.

Nov. 22. Nineteenth postoperative day. Lumbar puncture was done to diminish slight bulging of brain area. Twelve cubic centimeters of cerebro-

spinal fluid removed. The area became sunken in center and fixed at margins. There was no leakage of cerebrospinal fluid. No likelihood of rupture into ventricle. Cerebrospinal fluid was clear; albumin, normal; globulin, slight trace; sugar, normal; lactic acid, very slight trace; total cells, three lymphocytes. Scalp edges strapped partly together with adhesive strips. This tended to depress the surface of the brain substance.

Nov. 23. Aphasia was rapidly clearing since lumbar puncture the day before. Improvement in speech since lumbar puncture was greater than in the entire postoperative course preceding puncture. He was eating well and sleeping well; bowels were moving well. Temperature 99° F. "This is the most rapid improvement ever noted in convalescence of patient with brain abscess."

Nov. 24. The patient's general condition was markedly improved. He could carry on a conversation very well. There was practically no anomia. He had some difficulty in saying what he would like to say, but he did not use the wrong word. He had good use of right biceps and almost equal use of triceps. The patient was elated over his improvement. His being a physician made it more interesting.

The patient was out of bed on December 1. The entire area was healed over by the 5th. Return of function in right lower extremity was good. Movements of right upper extremity was improving.

Other than for a very annoying cough, at which time considerable sputum was raised, and the crying spells associated with his emotional condition due to aphasia, the patient made an uneventful recovery until the 11th, a few days after his first time out of bed. At this time he developed an acute pharyngitis or cold with temperature elevated almost to 104° F. and with an associated rise in pulse. This condition lasted about four days, when the temperature subsided to between 99° and 100° F.

Throat culture: streptococcus hemolyticus and staphylococcus aureus.

Dec. 13. Note by Dr. Wortis: "Patient is having acute pharyngitis with throat redness. Swelling of the glands of the neck and rise of temperature. Abdominal reflex on right has returned. Normal visual fields and fundi. Bilateral plantar flexion. Absence of position sense; diminution of vibratory and pin-prick on right side. He has more movement of right arm, especially finger movements. Speech continues to improve. Doing very well."

After attending a Christmas party on December 23 in the hospital, the patient had slight jerking movements of the right side of face, arm and hands for about twenty minutes. These were noticed again during the evening. However, he was able to be up and about his room and was walking (Fig. 5).

On Dec. 28 he was able to write his name with his right hand. The wound was completely healed by Jan. 4, 1934, with the exception of a very small granulating area about the size of a finger nail.

The patient developed fever following the sore throat on January 4 and 5, from which he suffered for several weeks. He was discharged to his home on Jan. 18, 1934.

On June 18, 1934 (Fig. 6), a plastic operation on his scalp was performed at the New York Hospital. He made a prompt recovery and was discharged on June 30. He spent the summer in New England.

June 27, 1935. Examination revealed the following: "At the site of the cranial defect there is a depression when the patient is in upright position, but when he leans to the left there is slight bulging, as is usually seen in such defects. The scalp reached the level of the skull at this time, but when he reassumed his sitting position it became slightly depressed. He has no headaches, and is getting along very well."

Neurologic note by Dr. Wortis: "He has gained weight. He has occasional attacks of twitching of the toes of the right foot. This is apt to occur at night when he lies down and is about to fall asleep. He shows no impairment of

Fig. 6. Appearance of healed area on June 17, 1934, day preceding scalp plastic procedure, seven and one-half months after operation for metastatic brain abscess.

visual acuity and no defect on cross testing. He has slight weakness of the right lower face, and increase in deep reflexes on the right half of the body. There is still slight motor weakness of the right arm and leg, but less than observed at previous examination. There is impairment of position sense of the fingers of the right hand, but this is sensory and not motor, because of the fact that he can recognize position of the fingers of the left hand and imitate them in the right hand with closed eyes. Astereognosis still exists. The finger to nose test is accurately performed with eyes closed, which shows that he has had some return of muscle-joint-tendon sense or position sense in the right upper extremity. He has slight speech defect, particularly in the ability to spell out words. Otherwise his ability to use words and his understanding of words are normal. He is very much improved and there is marked improvement since the last observation."

Dec. 19, 1935. Neurologic note by Dr. Wortis: "Fundi are normal . . . His headaches are improved and bother him less than previously. There is slight right pseudo-peripheral facial. The right palpebral fissure is slightly greater than the left. The reflexes are increased on the right side. There is plantar flexion on both sides. He has exacerbation of thalamic pain in the right arm, leg and cheek and on the right chest. These can be precipitated by pressure over the decompression area. He shows some return of position sense in the thumb and right little finger. . . . There is slight difficulty in position sense in the toes on the right side, much less than on previous examinations. There

is no visual field defect to cross testing and the diminution of sensation to pin prick is not delimited to the midline, but extends about 3 inches to the right of the midline in the chest region anteriorly.

"He has had three convulsive seizures starting with localized Jacksonian twitches but not becoming bilateral. He has improved considerably since the last examination. This is especially noticeable in his speech, and he only occasionally slows down his speech to find a word. The motor power in the right arm varies from day to day, but he is walking well."

The patient was discharged from the service and went to Pensacola, where he is living at the time of this report, more than two years following operation.

SUMMARY

A brief report of the several recorded cases of metastatic brain abscess which have recovered following operation has been given including one case of acute metastatic abscess. Review of the literature shows that about 50 per cent of metastatic brain abscesses are solitary or single and a summation of conditions in favor of recovery of a number of these cases is given.

The causes of death are discussed.

The pathology associated with a solitary or single brain abscess is described.

The time advocated for operation is the sixth or seventh day due to the fact that most of the cases on record have died by the tenth or twelfth day, before encapsulation was effected.

An operative procedure which is advocated in cases of *acute* metastatic brain abscess is described in detail and the reasons given therefor.

A rather detailed description of the postoperative management in these cases including type of dressings, nursing care, etc., is made.

A detailed report is made of a case of acute metastatic brain abscess of the left parietal region, secondary to lung abscess, with operation and recovery.

BIBLIOGRAPHY

1. Adson, A. W., and Craig, W. McK.: Surgical Management of Brain Abscess, Ann. Surg. *101:* 7 (Jan.) 1935.
2. Atkinson, E. M.: Abscess of the Brain. London: Medical Publications Ltd., 1934, p. 289.
3. Barling, S.: A Case of Cerebral Abscess Complicating Abscess of Lung; Operation and Recovery, Lancet *1:* 121, 1917.
4. Cairns, H., and Donald, C.: Discussion on Diagnosis and Treatment of Abscess of the Brain, Proc. Roy. Soc. Med. *27:* 1643-1668 (Oct.) 1934.
5. Cohen, I.: Cerebral Complications of Putrid Pleuro-pulmonary Suppuration, Arch. Neurol. & Psychiat. *32:* 174-183 (July) 1934.

6. Eagleton, W. P.: Brain Abscess. New York: Macmillan Company, 1922, p. 297.

7. Eagleton, W. P.: Personal Communication.

8. Evans, W.: Pathology and Etiology of Brain Abscess, Lancet *1:* 1231 (June 6) and 1289 (June 13) 1931.

9. Gardner, W. J.: Metastatic Abscesses of the Brain of Pulmonary Origin: Report of Two Cases, Arch. Neurol. & Psychiat. *19:* 904-908 (May) 1928.

10. Gardner, W. J.: Quoted by Woltman; Personal Communication.

11. Globus, J. H.: Personal Communication.

12. Grant, F. C.: Mortality from Abscess of the Brain, J. A. M. A. *99:* 550-556 (Aug. 13) 1932.

13. Hurst, A. F.: A Case of Cerebral Abscess Complicating Empyema; Operation and Recovery, Lancet *1:* 605, 1925.

14. King, J. E. J.: Brain Abscess; External Rupture of "Capsule" with Pericapsular Brain Necrosis, Ann. Surg. *101:* 190-200 (Jan.) 1935.

15. Macewen, William: Pyogenic Infective Diseases of the Brain and Spinal Cord. New York: Macmillan Company, 1893.

16. Parker, H. L.: Metastatic Abscesses of the Brain: A Clinical Study, Am. J. M. Sc. *180:* 699-711 (Nov.) 1930.

17. Roulland, H.: Absces metastatique du cerveau au cours d'une suppuration pleurale; trepanation, drainage de l'absces, guerison, Paris Chir. *9:* 613, 1917.

18. Schorstein, G. I.: Abscess of the Brain in Association with Pulmonary Disease, Lancet *2:* 843-853, 1909.

19. Woltman, H. W.: Spinal Fluid Count and Encapsulation of Brain Abscess; Attempt to Correlate These Factors, and to Determine Optimal Time for Drainage, J. A. M. A. *102:* 720-722 (March 11) 1933.

RETRODISPLACEMENTS OF THE UTERUS

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THE first description of a uterus being retrodisplaced was given by DeVenter in 1716. The first operation for its correction, by shortening the round ligaments through the inguinal canal, was performed upon animals by Alquie, of France, in 1840. However, he was not permitted to operate upon a living woman in the hospitals. The first operation upon a human was performed in 1881, by Alexander. Two years later Adams modified Alexander's operation. Since this time many writers (Hunter, Senter, Holyoke, Sims, Kelly, Oldhausen, Gilliam and others) have contributed much to the subject. Over 125 operations have been devised for the correction of retrodisplacement. One woman in every four has a retrodisplacement, and, undoubtedly many have been needlessly operated upon. This report consists of 275 cases operated upon. Fifty were operated upon at the Memphis General Hospital (University of Tennessee Clinic). The remaining 225 cases comprise the last series operated upon by me.

Properly to understand the symptoms and treatment of retrodisplacement a knowledge of the anatomy and physiology of the pelvic structures is necessary.

Supports of the Uterus, and Factors that Maintain it in a Normal Position

If a woman has a normal uterus, it usually means that she has good general musculature.

Mackenrodt's ligament, which joins the cervical, vesico-uterine and utero-sacral fasciae plays an important part and is essential for normal support. Yet the coccygeal and levator ani muscles with their fasciae act in a measure in supporting these structures. The recent investigations of Mengert and Plass prove that the paravaginal and uterine connective tissues (Mackenrodt) are essential for normal uterine support. There are, however, intra-abdominal pressure and the pelvic viscera to be reckoned with, as well as the serous and muscular ligaments in maintaining a normal position of the uterus. While the ligaments do not support the uterus, they have a physiologic function to perform in helping maintain the uterus in a normal position.

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Mengert and Plass have shown that the position of the patient greatly influences the position of a normal uterus. In the study of a series of patients they found that in the supine position for twenty four hours or longer, that the uterus usually became retrodisplaced; while the reverse was observed to take place in the abdominal position. The position of the patient accounts undoubtedly for the changed position of the uterus, which has been observed many times by me and can be better understood after their investigations.

Etiology

In the study of etiology one should not lose sight of an abnormally developed spine and pelvic frame work, which permit of an abnormal position of the viscera and wrong intra-abdominal pressure. In the asthenic type with a lack of a good musculature, and in the tall, narrow-waisted and broad-hipped individual, splanchnoptosis occurs, and this includes the uterus.

In discussing retrodisplaced uteri one must consider not only those with a normal uterus, but also those with congenital defects of endocrine origin, as well as those who have associated pelvic disease. An accident is seldom if ever a cause of a retrodisplacement unless the pelvic bones are crushed and the uterine supports torn loose. Of course in the presence of a pathologic condition the condition may be made worse in those already displaced. In those patients subjected to the trauma of childbirth, where the paravaginal and uterine fasciae have been lacerated, the uterus not only drops backwards, but there finally develops descensus of the uterus. Therefore many agents are responsible and under the following classification will be found various etiologic conditions.

Classification

1. Physiologic
   a. Before puberty
   b. After menopause
   c. Position of the patient
2. Congenital
   a. Endocrine (uterus fails to rotate anteriorly: retrocessed)
   b. Developmental defects
3. Acquired
   a. Conditions inherent in the uterus
      Infections
      New growths
      Failure to involute after pregnancy, etc.

b. Para-uterine pathology

Pelvic infections, endometriosis

Pelvic tumors

Lacerations of the para-uterine and vaginal fasciae, and other lacerations of structures which assist in uterine support

Symptoms

The physiologic retrodisplaced uterus is symptomless. All patients with a congenital retrocessed uterus have symptoms both local and general of a hypo-endocrine condition. A deficiency of the anterior pituitary lobe hormones permits the uterus to remain firm (fibrous), retrocessed, small, anteverted, and anteflexed. The patient is often obese, has an abnormal distribution of hair, has a low metabolic exchange (due to a deficiency of the pituitary hormone acting on the thyroid). This type of patient lacks "pep", is frigid, has amenorrhea or oligomenorrhea, and is sterile.

In early life the ovaries may become the seat of pathologic changes interfering with the estrin hormone production, which result in a failure of uterine development and rotation forward.

The tall, thin individual, with broad hips, and a contracted chest and abdomen (asthenic type), with a poor musculature, has usually also a dysfunction of the endocrine glands. This type has a visceroptosis; therefore, the symptoms of a visceroptosis are complained of besides the symptoms of a dysfunction of the endocrine glands.

The symptoms of the acquired type due to infection and tumors are usually masked by uterine or para-uterine pathology. The uncomplicated displacement is usually symptomless; yet, some patients suffer from extreme dysmenorrhea (essential), backache, insomnia, nervousness, sterility (25 per cent), gastro-intestinal symptoms and some become neurotic. Nearly all with pathology have definite symptoms and demand interference for their relief.

If the ovary is prolapsed, dyspareunia is often a symptom and cystic formation is quite possible. One-sided pelvic pain in a retrodisplacement is frequently due to a twisting of the pampiniform pelvic plexus of veins, which produces a varicosity. Those with a chronic gonorrheal pelvis have leukorrhea, exaggerated pelvic pain and an adherent fixed uterus. In acute pelvic infections the symptoms are masked by the coexisting pathology.

TABLE 1

Summary of symptoms in the last 50 primary retrodisplacements operated upon at the Memphis General Hospital.

	Per Cent
Pelvic discomfort	37
Backache	16
Menstrual disturbance	17

Most of these patients were tested with the pessary before admittance to the hospital.

TABLE 2

Summary of the symptoms in the last 225 patients operated upon by the author.

	Per Cent
Pelvic discomfort	60.3
Backache	50.1
Nervousness	30.6
Menstrual disturbances	30.6

Above percentages included all types of retrodisplacements requiring an operation. A large number complained of leukorrhea, bladder symptoms, dyspareunia, sterility, etc. Only those patients with definite symptoms in uncomplicated cases were operated upon. Only by a competent physician asking each patient the same questions can an accurate percentage of symptoms be obtained.

PROGNOSIS

The prognosis in the congenital endocrine cases is unfavorable, yet subject to improvement in symptoms by the proper treatment. Physical defects in the osseous system are by necessity unfavorable; yet corrective measures will maintain the uterus in a normal position and alleviate some of their symptoms. The result in the simple acquired type is good. Proper corrective measures in those resulting from the traumatism of labor are very satisfactory. After the removal of diseased pelvic structures the uterus can be maintained in a forward position by constructive measures with good results.

TREATMENT

In many treatment is unnecessary. Under the first heading no treatment is required, unless it be the change of position, in those too long in the supine posture. In those with a retrocession due to an endocrine dysfunction the uterus is anteverted, small and fibrous and the displacement is due to a failure of the uterus to enlarge and rotate anteriorly. General symptoms only require treatment. If the patient is typical hypopituitary, with a low metabolic rate, obesity, etc.; then the giving of glandular preparations is indicated together

with exercise, a protein diet and in some stimulating doses of x-ray over the hypophyseal area. These stimulating doses increase pituitary function which acts upon the ovaries and thyroid, thereby assisting in the growth of the uterus. An anterior pituitary preparation may be of benefit. Usually thyroid extract is indicated. Estrogenic hormones may stimulate the uterus and cause it to grow and function better.

If dysmenorrhea is a prominent symptom, a uterine dilatation may be of benefit. No benefit will be derived by a corrective operation. Suspension of the uterus may be beneficial in those with bony defects, with an abnormal index, as described by Sturmdorff, Truslow, Dickerson and others. However, too much improvement should not be anticipated.

In the acquired type due to new growths, the treatment should be directed to the etiology and if the uterus can be preserved, then any suitable technic for its correction is advised. In the simple primary displacement (without para-uterine pathology) producing definite symptoms, the treatment depends upon the etiology and length of time displaced. In the latter variety following a recent pregnancy the pessary is a valuable instrument. I have had a number of such patients wear a pessary for three or four months (permitting the circulation to become reestablished and the uterus to involute), in whom the uterus has remained in a normal position thereafter. In pregnancy where the uterus is in the third degree retrodisplacement the wearing of a pessary past the third month will prevent the uterus from becoming engaged under the pelvic brim; thereby, preventing an abortion. In an uncomplicated retrodisplacement the pessary also serves a useful purpose in determining whether relief from pain will follow correction of its abnormal position. If so, relief of symptoms may be anticipated by an operation.

In those with para-uterine pathology the symptoms are mostly due to the associated lesions; therefore the patient requires an operation for the removal of these lesions and the correction of the displacement. Those with a laceration (rectocele, cystocele, laceration of cervix, etc.) are corrected by plastic surgery, in addition to suspension of the uterus.

Selection of Operation

In those requiring surgical intervention many problems should be studied before deciding which of the many devised operations to use. Certainly the same technic for all types of retrodisplacements is unsound surgical judgment and accounts for many failures. The correction of a retrodisplacement of the simple primary, or ac-

quired type is quite different from one complicated by the traumatism of childbirth and para-uterine disease.

Seldom today is the inguinal canal route used. Formerly it was the most popular route in the uncomplicated case, due to the danger at that time of entering the abdominal cavity. The inguinal route is used by Jones and others successfully, however, in laparotomized patients.

In the obese elderly woman, usually a poor surgical risk, with a first or second degree prolapse, the sacro-uterine and round ligaments may be utilized vaginally to correct the retrodisplacement and the descensus.

In the abdominal approach the question arises whether the uterus should be suspended to the abdominal wall, the ligaments plicated, or shortened extraperitoneally, or shortened anteriorly or posteriorly to the uterus. Abdominal fixation and suspension should only be selected in those past the childbearing age, when accompanied by an advanced uterine prolapse. The Gilliam, Oldshausen and similar types of operations, will support the uterus, and the patient may go through childbirth without difficulty; however, the danger is greater than in other types of operations and intestinal obstruction is always a possibility. Two cases of intestinal obstruction following a Gilliam operation caused me to abandon this type of operation several years ago. Some good gynecologists still perform the Olshausen operation, but as stated in a recent text on gynecology, "the operation has few advocates".

In an uncomplicated retrodisplacement in the nulliparous or in the multiparous woman who has not suffered from the trauma of parturition, those with symptoms are relieved in about 65 per cent of cases by the correction of their displacement. Those in whom dysmenorrhea or pelvic pain is a predominant symptom presacral sympathectomy will increase the percentage of cures.

A simpler type of operation is unquestionably more rational than a suspension to the abdominal wall in uncomplicated cases. If the uterus is in the third degree retrodisplacement with the cervix pointing toward the pubic bone, in those with a deficient musculature or a descensus of the uterus, a shortening of the sacro-uterine ligaments should first be performed.

The Coffey, Willis, Baldy-Webster or any of the extraperitoneal operations will sustain the uterus in a normal position after shortening these ligaments. The Baldy-Webster operation is successful and useful in those with ovarian prolapse. It is contraindicated in those who have had a parametritis or thrombophlebitis, for the fear of

disturbing an existing thrombosis. The occurrence of an intestinal obstruction following a Baldy-Webster operation was reported by me in 1916. This case caused me to prefer an operation in which no raw surface is exposed to the peritoneal cavity. The Baldy-Webster is not always successful in patients who have descensus of the uterus. However, shortening the sacro-uterine ligaments first adds materially to effectiveness. An improperly performed operation by suturing the ligaments too low on the uterus permits it to topple over its ligamental attachments and accounts for some of the failures.

Rarely one will find a retrodisplacement with the round ligaments attached too low on the uterine body instead of a normal fundal attachment. In such cases, whether congenital or acquired, it is necessary to suture the ligaments where they normally belong before proceeding with any type of operation. If the cervix points in a normal direction, a flexion is present and there is no sagging of the uterus, it is not necessary to shorten the sacro-uterine ligaments. After the latter ligaments have been shortened in a retroversion, a Barrett, Crossen or a Simpson-Montgomery modification of a Gilliam operation in which the round ligaments are entirely covered by peritoneum gives better and surer results. In the Barrett or Simpson operation the ligaments are shortened by pulling them through a normal pulley (internal ring) via the physiologic and anatomic route. In the Barrett and Simpson and Crossen modification of a Gilliam operation the proximal or stronger part of the round ligament is utilized and is entirely covered by the peritoneum.

In the Baldy-Webster the outer or weaker part of the ligament is left to sustain the uterus. In the presence of varicosities or ovarian prolapse these structures should be elevated, which is well taken care of by the latter types of operation. In the extraperitoneal operation there is no danger of intestinal obstruction and during pregnancy there is not the risk as in those operations where the ligaments are pulled up through the center of the pelvic cavity and attached to the abdominal wall. Anterior shortening of the round ligaments is not applicable to those with ovarian prolapse, varicosities or descensus of the uterus.

Obese, elderly women, past the menopause with descensus of the first or second degree are frequently poor surgical risks, and in these the Watkins interposition operation may be successful. Especially is this operation indicated if a large cystocele coexists. In the treatment of those with a third degree prolapse or with too much relaxation, the Watkins operation is unsuccessful, as the entire mass will protrude afterward. After a salpingectomy the round and

broad ligaments are utilized to bring the uterus forward and cover over raw areas.

The small uncomplicated retrodisplaced uterus is best treated by an anterior fixation of the ligaments to the uterus. This is particularly true if the round ligaments are rather short or atrophic, because they may be torn in the extraperitoneal operation, and besides the broad ligaments can be utilized in strengthening and aiding in their support.

The enlarged, boggy uterus, uncomplicated or complicated by a first or second degree descensus is best treated by the Barrett, Simpson or a Crossen modification of a Gilliam operation. If the cervix is pointing anteriorly, it is essential to shorten the sacro-uterine ligaments first. The plicating of the round ligaments is seldom deemed advisable, unless done as a prophylactic measure, when the uterus is small and uncomplicated, during a pelvic operation for other conditions. This type of an operation is probably the simplest procedure of all technically.

Only in exceptional cases is the Watkins operation or shortening of the ligaments through the vagina advised. I have performed many extraperitoneal operations, such as the Barrett or Simpson, and have examined these patients many years afterwards (some after pregnancies) and have invariably found the uterus in a normal position.

Conclusions

1. About 25 per cent of women have a retrodisplacement of the uterus.

2. Small, poorly developed, retrocessed uteri, are usually the result of hypopituitarism and requires non-operative treatment.

3. The simple or primary acquired type only requires operative correction when producing definite symptoms. Many unnecessary operations are undoubtedly performed upon this type.

4. The pessary serves a most useful purpose during the early months of pregnancy in retrodisplacements, also in those displacements immediately following labor. It is a splendid instrument to use as a test for the relief of symptoms in retrodisplacements before operating and in those that are refused, or refuse, operative treatment.

5. The symptoms of an acquired retrodisplacement depend upon the degree and the length of time misplaced, and whether or not

there has been a stretching or tearing loose of the supportive structures of the uterus causing a prolapse.

6. The secondary acquired types with associated lesions should be operated upon.

7. Those operations that do not expose the round ligaments to the peritoneal viscera are as effective and much less hazardous than other technical procedures.

8. The pathology and the age of the patient should be considered in each case, then the operation that seems best suited should be performed.

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REFERENCES

1. Abell, I.: The Technique of Suspension of the Uterus, Surg., Gynec. & Obst. *42:* 828-831 (June) 1926.
2. Black, W. T.: Retrodisplacements of the Uterus, J. Tennessee M. A. *9:* 155 (Aug.) 1916.
3. Black, W. T.: Retrodisplacements of the Uterus with Suggestions Regarding their Proper Treatment, South. M. J. *15:* 310-316 (Apr.) 1922.
4. Black, W. T.: Retrodisplacements of the Uterus, J. Tennessee M. A. *27:* 207-211 (June) 1934.
5. Crossen, H. G. and Crossen, R. J.: Operative Gynecology. St. Louis: C. V. Mosby Co., 1930.
6. Curtis, A. H.: Obstetrics and Gynecology, Vol. 1. Philadelphia: W. B. Saunders Co., 1933.
7. Davis, Carl H.: Gynecology and Obstetrics, Vol. 2.
8. Gardner, G. H.: When is Surgery Indicated in Retrodisplacements of the Uterus? Am. J. Obst. & Gynec. *30:* 596-602 (Oct.) 1935.
9. Jones, A. F.: Application of the Alexander Operation Technique with Celiotomy, Am. J. Obst. & Gynec. (Read before the Am. Assn. Gynec. & Abd. Surgeons, Sept., 1934.)
10. Mazer, Chas. and Goldsmith, L.: Clinical Endocrinology of the Female. Philadelphia: W. B. Saunders Co., 1932.
11. Mengert, W. F.; Harris, L. J., and Plass, E. D.: Mechanics of Uterine Support and Position—Factors Influencing Uterine Position. (Read before Central States Assn., Oct. 12, 1935.)
12. Strumdorf, A.: Gynoplastic Technology. Philadelphia: F. A. Davis and Co., 1919.

THE RELATIONSHIP OF CALCIFIED MESENTERIC GLANDS TO ABDOMINAL PAIN

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ASIDE from metastatic malignant disease, practically all abnormalities of the mesenteric lymph nodes have usually been classified under the term of *tabes mesenterica*. Although most writers on the subject have given Ball,[8] 1775, credit for this descriptive phrase, it is apparent that the disease was recognized prior to this time. Boneti[6] in his "Sepulchretum" published in 1700 quotes from Basilia, 1627, an autopsy report of a 12 year old child concerning "Tabes a Glandulis mesenterii et colli scirrhofis." Sauvages' "Nosolgia,"[26] 1768, gives Baglivi[2] credit for calling tuberculosis of the mesenterium, tabes mesenterica, and although we have been unable to locate the phrase in Baglivi's works, we feel certain that he understood the disease.

Although there is voluminous literature on this subject, there is still considerable confusion in the minds of clinicians concerning the importance of this fairly common malady. It has generally been conceded that tuberculosis is the usual etiologic agent in all adenopathies of the mesentery. Recently, however, attention has been called to the possibility of other types of infection being responsible for enlargement of these lymph glands (Corner,[10] Mead,[18] Strombeck[31] and others). Acute mesenteric adenitis is frequently encountered when dealing with acute abdominal pain in children and adolescents. The symptoms and signs so nearly mimic those of appendicitis, on many occasions, that the patient is subjected to operation under the diagnosis of acute appendicitis (Parker[21] Risley,[24] Clute,[9] Bell,[4] Mead,[18] and others). It is well known that in the majority of these acute cases the patient is usually relieved of his discomfort following exploratory laparotomy and appendectomy. This relief takes place even if recurring attacks have been noted in the past and in the absence of any apparent disease in the appendix itself. True, we always advise the parents that general hygienic measures such as rest, a liberal simple diet, pasteurized milk, fresh air and sunshine, and attention to the bowels would be desirable until health is completely restored. Probably some, but often little, attention may be given to such advice with almost universal complete and

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prompt recovery of the patient. That many of these acute glandular enlargements are not tuberculous would seem evident, even if we have frequently questioned the pathologic report of "chronic inflammation" or simple "lymphoid hyperplasia" on a biopsied gland from such patients.

Rarely the acute or subacute stage of tuberculous mesenteric adenitis is recognized; such cases have been reported by Richardson,[23] Parker,[21] Talbot,[32] Bell[4] and others. We believe that this stage of the process is infrequently seen, and that the usual acute

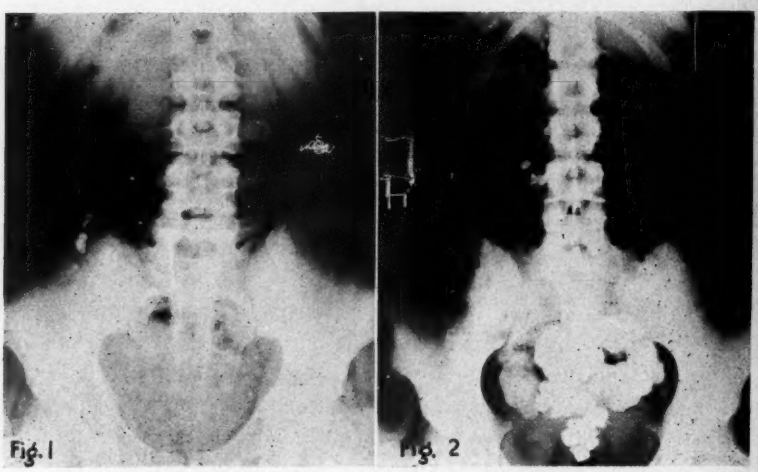


Fig. 1. Multiple glands in ileocecal region.
Fig. 2. Glands probably in the mesentery of the ileum.

adenopathy will not go on to this suppurative phase of broken down glands forming abscesses or rupturing to produce tuberculous peritonitis. Those that are not tuberculous are apt to be of short duration and to clear up rapidly. The tuberculous ones may also heal without any illness that causes the patient or his family to be aware of any serious trouble. Healing may take place by complete absorption but often by calcification. This end stage may be reached without any apparent disability at any time significant of the true situation.

On the other hand, in seeking a satisfactory explanation for atypical abdominal pain, we frequently find calcification in the glands of the mesentery either in the x-ray film or at exploration. It is possible that other inflammatory processes in these glands may heal by way of calcification but usually when such conditions are found, we believe the tubercle bacillus to be the etiologic agent.

This has been shown to be of the bovine type in a large percentage of cases but the human bacillus may be isolated in some such patients[10,11,14]. By far the larger number of individuals with mesenteric glandular tuberculosis, however, do not have any other active process that can be located. Auchincloss[1] feels that the mesenteric involvement is probably in the group of so called primary tuberculous infections. It is frequently impossible from clinical and laboratory methods to make a positive diagnosis of the type of lymphadenitis present in the mesentery. It has been the feeling of many

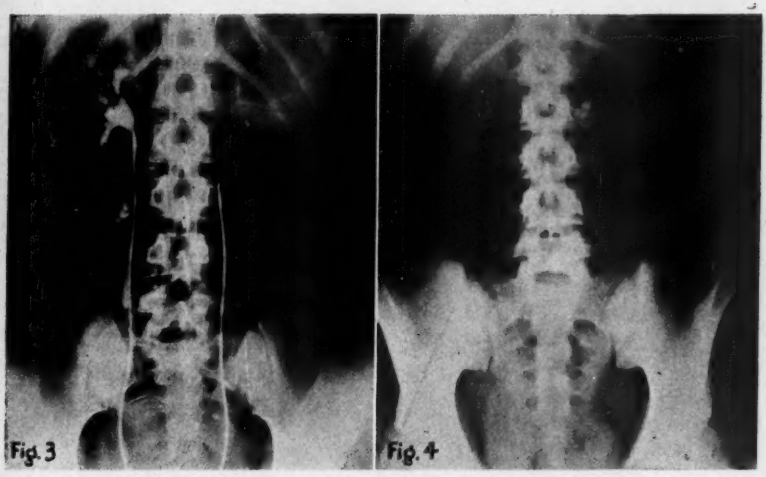


Fig. 3. Pyelogram to rule out the possibility of ureteral calculus.
Fig. 4. High and to the left of the spine near the root of the mesentery.

surgeons that calcified glands in the mesentery always represent a healed process and that it is not sound to attribute any abdominal symptoms that a patient might have to such glands.[19] It is perfectly true that approximately half of the children with obvious calcification in these glands do not have any symptoms that could be attributed to them.[20] The other half, however, do have at some time, abdominal discomfort which may be slight or transient or may be severe and frequently recurring with sufficient irritation to cause a disinterest in food with the resultant failure to maintain or gain weight. Also, in some instances these individuals during adolescence or young adult life finally are explored on the basis of a probable recurring appendicitis. At operation the appendix may be found entirely normal or it may have some evidence of previous inflammation. We often have the feeling, however, that the lesion found in the appendix is insufficient to account for the condition for

which the operation was undertaken. When calcified mesenteric glands are found under these circumstances, we wish to direct your attention to the possibility of their role in the symptomatology and offer evidence that in properly selected cases, the careful removal of these glands will be attended with gratifying results. Also, that if the larger glands are not removed, the patient is likely to continue to complain of abdominal pain. These points have previously been stressed by Braithwaite,[6] Auchincloss[1] and Golden and Reeves.[13]

We will not attempt to consider the whole question of mesenteric adenitis in its various manifestations further, but refer you to the excellent articles on the subject by Strombeck[31] and Mead.[18] We will also only mention the various obvious obstructive and irritative interference with the ureter, bile ducts, intestinal tract, etc., cases of which have been recorded by several authors.[33, 28, 15, 9, 27, 22, 30]

Smith and Ames[29] reporting on calcified mesenteric glands at the Children's Hospital in Boston during the past ten years have contributed much to clarify the subject. It may be well to quote their conclusions entirely:

1. A study has been made of 147 children with calcified abdominal lymph nodes seen at the Children's Hospital during the past 10 years.

2. The relation of this finding to tuberculosis in general is discussed. The evidence points to the ingestion of tubercle bacilli, probably from infected milk, as being the usual cause of calcified abdominal glands. Such glands apparently are not important foci for the dissemination of the tuberculosis to other parts of the body. Active pulmonary tuberculosis did not develop in the later course of any of the patients. Associated tuberculosis lesions were more commonly non-pulmonary than pulmonary. Two children died of tuberculous meningitis, but this was not definitely due to dissemination from the abdominal glands.

3. About half of the total group had no symptoms referable to the glands. In the remainder the usual symptom was prolonged and recurrent abdominal pain. In a few other children there were miscellaneous symptoms unexplained except by the presence of the calcified glands. Physical examination presented no characteristic picture.

4. A review of the roentgenograms in the children with and without abdominal pain has shown no particular size, location, degree of calcification, or number of such glands, to be characteristic for the production of pain.

5. In a few female children the presence of calcified glands very low in the pelvis suggest the possibility of their infection from the pelvic peritoneum or the genital organs.

6. Treatment may be symptomatic with moderate rest and attention to diet and hygiene, or it may be surgical, either for exploration or for complete excision of the glands in cases refractory to symptomatic treatment.

7. In sixty-nine children without local symptoms, no treatment was usually advocated beyond safeguarding the milk supply. The outcome in this group

has been satisfactory except for the two children with meningeal involvement. Of seventy-one children with symptoms, fifty-seven (80.3 per cent) have recovered under general hygienic treatment; eleven (15.5 per cent) still have some pain; and three (4.2 per cent) have been treated surgically with relief. Surgery at present seems indicated in one other child whose pain is increasing under non-surgical management. Surgery seems to us advisable and most successful only after the prolonged trial of general symptomatic measure.

Our data have been derived from the records of fifty-three patients with calcified mesenteric glands occurring in the Massachusetts General Hospital during the past ten years. We have included

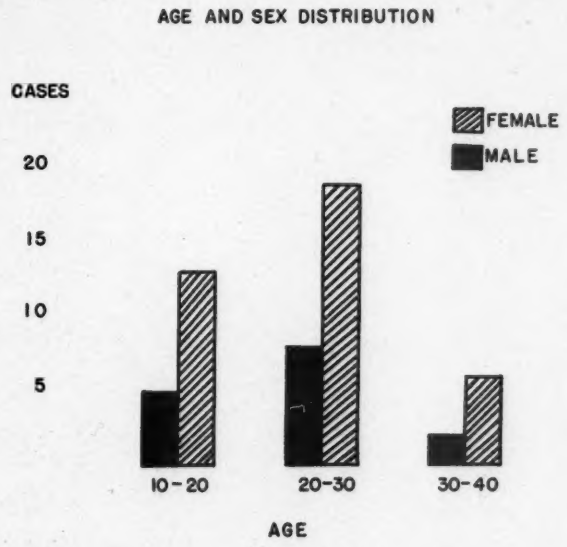


Figure 5.

for study all records that would indicate the probability of calcified glands as a factor in the symptoms for which the patient sought relief other than those affecting the function of specific structures. All of the patients upon which this report is based were subjected to laparotomy, and the report does not include those with mild symptoms or those entirely symptomless, or with no symptoms referable to the region of the glands, many of which are found by routine examinations for other conditions. We have excluded fourteen cases that could not be traced, bringing the total for final analysis down to thirty-nine patients. All of these had come to the hospital for relief of abdominal pain, the majority of them under the diagnosis of chronic, interval or recurring appendicitis. A few were sent in under the diagnosis of acute appendicitis.

The average age of our patients was 22 years. The sex ratio was 2½ to 1 in favor of females. Symptoms had been noted from one month to fourteen years, the average being 2.2 years. In over 40 per cent, attacks occurred once a week or more often. In more than 60 per cent these attacks did not last longer than a few hours. The patients were about equally divided in characterizing their pain as sharp or dull, and many volunteered the statement that the pain was a sudden sharp attack followed by a dull ache. Half stated that the attacks were brought on by exertion and the remainder associated

Fig. 6. Schematic representation of the location of calcified mesenteric glands in 309 cases studied by Strombeck. Note the preponderance on the right side. The circles represent the umbilicus and McBurney's point.

them with eating, deep breathing or the erect posture, etc., all circumstances suggesting a mechanical factor. In about two thirds of the cases, constipation was not present and only two patients mentioned it as associated with attacks. Two thirds had never vomited in an attack and two fifths had never had any nausea. Nine patients described mechanical tricks which they had learned to relieve the pain, such as lying on the abdomen, or flexing the thighs. It was difficult to get many data on the source of infection. Rarely were these patients known to have been exposed to tuberculosis. At some time during their lives many had used milk that had not been pasteurized. Few had active tuberculosis elsewhere and, when present, this was apt to be in other glands, usually cervical. Only one of our patients followed is known to have developed tuberculosis elsewhere in the body. Rarely was there a record of acute onset simulating the type of acute mesenteric adenitis so frequently seen and mistaken

for acute appendicitis in childhood. Most of the patients were underweight and otherwise below par physically.

Physical examination invariably revealed tenderness over the involved glands. Usually in the right lower quadrant but above McBurney's point, occasionally to the left of the umbilicus or in the left hypochondrium. There was little if any spasm in the abdominal muscles, and no "rebound" tenderness. A mass was occasionally felt. Nearly half of the cases showed admission temperatures of 99 to 100 degrees. The white blood count was below 10,000 in two thirds and slight anemia was noted in about one third of the patients. The diagnosis was often confirmed by a flat plate of the

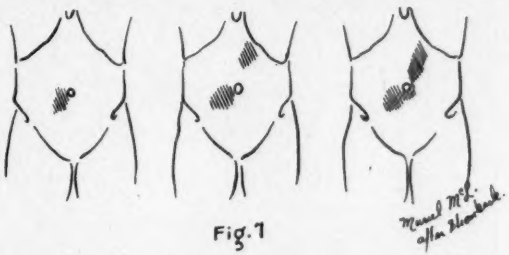


Fig. 7. Schematic representation of the location of tenderness in the cases studied by Strombeck, roughly following the course of the mesenteric vessels.

abdomen usually made to rule out the possibility of ureteral calculus. The roentgenograms revealed that 60 per cent of the calcified nodes were multiple while the remainder appeared to be single.

At operation, two thirds of the calcified glands were found in the mesentery of the ileum, the others being divided among the jejunal mesentery mesocolon and the root of the mesentery. The operative notes reveal that in one third of the cases with definite calcified nodes, there were also other enlarged glands present. In six cases, caseous or active glands were mentioned as well. In thirty-five of these patients, exploratory laparotomy and appendectomy was done with an occasional biopsy of a single node. In eighteen, the larger calcified glands were removed in addition to appendectomy. In the former group, twenty-four have been followed and eleven are well and without attacks. Thirteen have continued to have the same type of pain that originally brought them to the hospital. We have traced fifteen of those who had calcified glands removed as well as appendectomy. Thirteen of these are entirely relieved of their symptoms. One has been re-operated upon elsewhere for continued discomfort attributed to adhesions and is now well. The other is no better and should be re-operated upon as recent x-rays show that

other calcified glands are present. None of the patients in either group has died and in no case either from removal of a large group of glands or biopsy of a single node, has there been any evidence of spread of the disease. Pathologic reports on the appendices removed revealed no tuberculosis. The calcified glands were usually reported as healed or inactive tuberculosis. Occasionally a gland would be reported as active tuberculosis.

The lymphatics draining the intestine follow very closely the blood vessels in the mesentery.[16] Mead[18] has shown that the glands

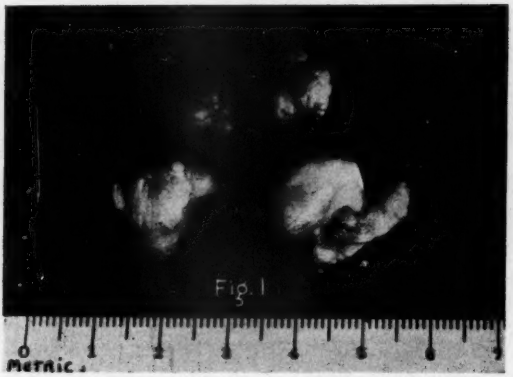
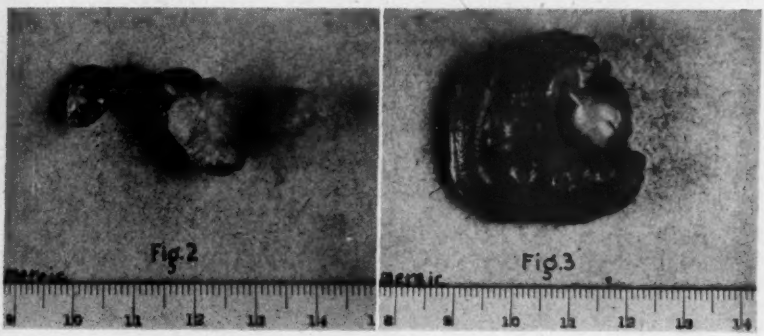


Fig. 8. Calcified and caseous mesenteric glands removed at operation. All come from a relatively small section of the mesentery of the ileum.

associated with the jejunum are more numerous than those in the region of the ileum but those in the ileum are larger. Also, that when abnormal enlargement results in these glands, that the smallest ones are found near the intestinal border while the larger ones are nearer the root of the mesentery. The fact that the majority of large calcified glands capable of giving symptoms are found in the ileocecal or low ileac mesentery may best be explained on the basis that the intestinal contents are slowed up in this region and infectious organisms get a better chance for lymphatic absorption as a result. Also, lymphatic tissue in the intestine itself in the form of Peyer's patches is more abundant in the ileum than in the rest of the gastro-intestinal tract.

It is difficult to explain why one patient will have abdominal pain from calcified mesenteric glands while another with glands of the same size, type and location will be symptom-free. In looking over our data, we find that there is little pathologic difference in the appendices of those who were symptom-free after simple explora-

tion and appendectomy and in the appendices of those who continued to have symptoms. It has occurred to us, however, that those who had the larger glands removed at operation in addition to appendectomy, had not only calcified glands but often caseous and hyperplastic glands as well. We feel that it is likely that those who will benefit most by excision of the glands harbor a chronic or continuing infection in the glands, as removal of such foci will undoubtedly lighten the load on the system in handling the remaining infection. In the truly quiescent glands with calcification, symptoms must be explained on the basis of one of the many theories for pain from



Figs. 9 and 10. Glands and appendix removed at operation. The glands were from the ileocecal angle. The appendix mesentery itself contains two small calcified glands. Tuberculosis of the appendix could not be proved on section.

this cause that have been suggested; such as interference with the circulation, pressure on the sympathetic nerves, pressure on sensory nerves or mechanical irritation.[1] Certainly in some instances these calcified masses may create sufficient drag on the mesentery by weight alone to cause pain. Also, in at least one of our patients there was a definite sawtooth edge to the glands suggesting the possibility of actual irritation.

In deciding the important question for or against operation when calcified glands are diagnosed accurately by preoperative studies one must evaluate the severity of the symptoms, the frequency of attacks and the amount of disability present. Also, the ability to rule out the appendix as a source of irritation. This can be done in many instances under the fluoroscope with barium in the colon. By this method, the tenderness and reproduction of the pain by pressure over the various structures often fix beyond much question the source from which the symptoms arise. After a conclusion is reached that mesenteric glands in a chronic or subacute state are at fault, then

the feasibility of attempting relief of symptoms along hygienic and other conservative lines must be taken into consideration. In children, it is obvious from the studies of Smith and Ames[29] that the majority of them can be expected to lose their symptoms after a

Table I

	Symptom Free	Symptoms Continued	Total
Exploratory laparotomy and appendectomy.....	11	13	24
Appendectomy and removal of calcified glands....	13	2	15

reasonable period of from a few weeks to several months. In adolescents and young adults, however, it would seem from our studies that

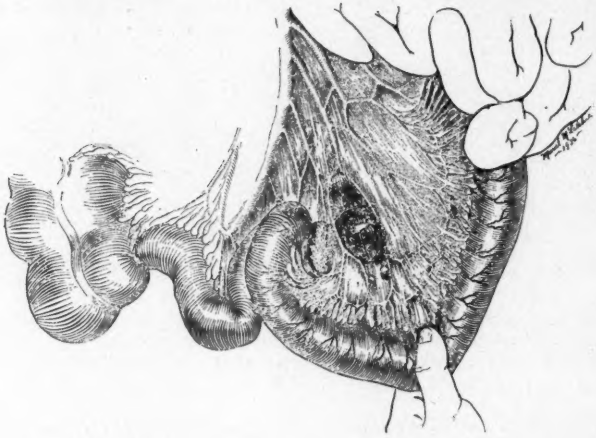


Fig. 11. Diagrammatic representation of actual appearance of calcified mesenteric glands in the mesentery of the ileum.

more than half of those with sufficient abdominal pain to warrant exploration will continue to have discomfort over long periods of time if the glands are left alone. Also, it would appear that the majority of a similar group that had their glands removed had become immediately symptom-free or nearly so and had continued well over quite long periods of time. (See Table I.) One must consider the status of the patient on the basis of financial and intellectual ability to carry out the necessary conservative measures. In certain cases of prolonged discomfort even under ideal conditions and where such surroundings are impractical, and also in the more severe types of disability, we must resort to surgical treatment. The situation is often well known before operation takes place but frequently these patients come to the operating table under the diagnosis of an acute

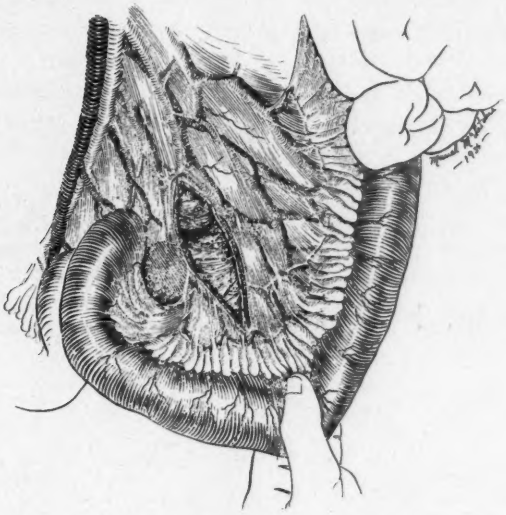


Fig. 12. The two small calcified glands near the intestinal margin and the large glands between the second and third arches have been removed. The two small acute glands near the root of the mesentery are left untouched. Great care is used to preserve the blood supply to the bowel.

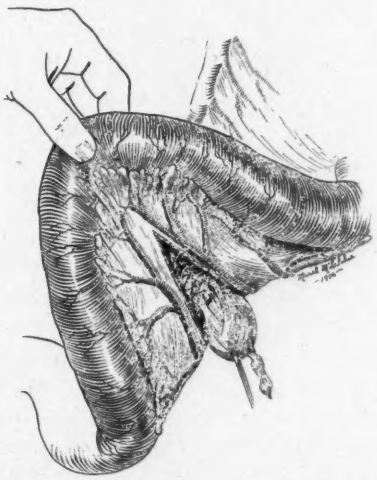


Fig. 13. The bowel is turned upward so that glands on the posterior leaf of the mesentery can be dissected free.

or interval condition, usually appendicitis. Then the surgeon must be prepared to evaluate the history, the condition of the patient and the conditions found, guiding himself on the basis of his own experi-

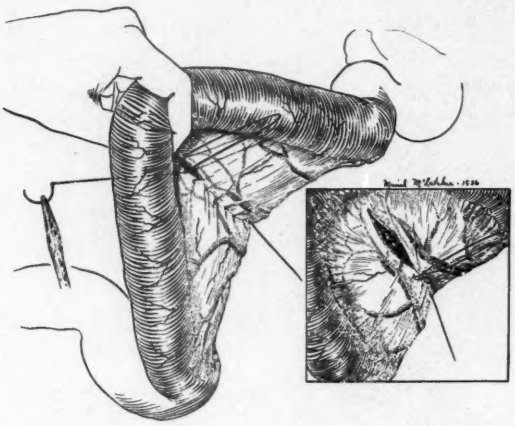


Fig. 14. Great care is used to suture the peritoneal surfaces in such a manner that adhesions will be minimized. After closure of the rent on the anterior surface, the needle may be passed through to the posterior surface.

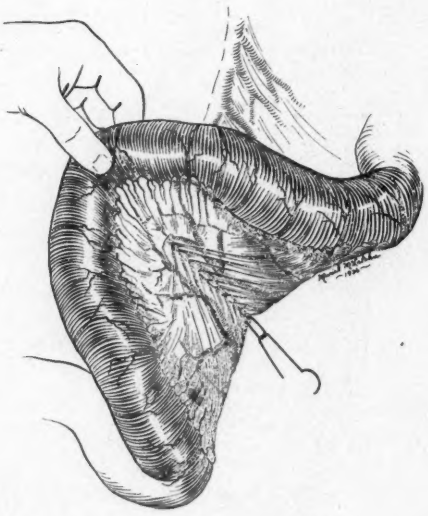


Fig. 15. The incision in the posterior leaf of the mesentery is carefully closed.

ence as well as his ability to handle the situation for the best interest of the patient. It is strongly recommended that the McBurney incision be surplanted by one that gives better exposure when dealing with a questionable diagnosis. When the appendix fails to show sufficient disease to explain the symptoms, then in addition to exploration to rule out such things as Meckel's diverticulum and pelvic

lesions, one should investigate the mesentery for calcified nodes as well.

One must bear in mind that lymph glands are found on both leaves of the mesentery. It will often be necessary to remove part of the calcified and caseous glands from the anterior surface of the mesentery and the remainder from the posterior surface. By doing this, it is possible to dissect the glands from the subperitoneal area of the mesentery without damage to the blood supply of the bowel. With great care the rent in the peritoneal surface can be closed with continuous Cushing stitches of fine chromic catgut on atraumatic curved needles in such a way as to leave a minimum of

Fig. 16. A very large mass of calcified and caseous glands in mesentery of the ileum necessitating the resection of several inches of the bowel.

roughened area. Too much stress cannot be laid on this important step in the technic as the small bowel has a persistently vicious habit of attaching itself to unperitonealized surfaces, especially if such involve the fatty mesentery. On rare occasions these glands form such a large mass that in removing them the defect in the mesentery cannot be successfully closed even if the blood supply is intact. Under these circumstances, it is preferable to resect enough of the bowel to avoid leaving a trap for more serious trouble. In only one of our patients was it necessary to resect any bowel, and in this case, the defect was so large that it could not be peritonealized without "fluting" the intestine. In spite of our attempts to leave no raw surfaces, one patient was later operated upon elsewhere for con-

tinued symptoms based on adhesions and was classed as unrelieved by our efforts. All of these patients had uncomplicated immediate recoveries with an average hospital stay of two weeks. Some attempt was made to prolong their convalescence after discharge but we find that the majority returned to school or work in the average time following laparotomy. Most of them lost their symptoms immediately while others, although vastly improved, continued for some time with minor abdominal complaints which finally cleared up in all but two cases.

In some instances it does not seem feasible to remove scattered calcified glands and in such cases, one should try hygienic measures rather than radical treatment. In one of our two unrelieved patients following attempt at radical cure, we find two years later some calcified glands showing in the follow-up x-ray film. It is quite possible that these were left behind at operation as in several of the cases some of the smaller areas of calcification were not removed. One must also consider the possibility that calcification may have taken place in some of the subacute glands purposely left untouched. In the patient above mentioned, we feel that she, as well as those who received no benefit from simple appendectomy, should be recalled for further radical measures. These patients are really miserable a good deal of the time and they get little sympathy from their physicians and consequently none from their families. They are often classed as neurasthenic and are prone to become a problem. We feel that there is adequate cause for their complaints and that surgical relief may be possible for most of them.

Summary and Conclusions

1. Tabes mesenterica, if applied to all diseases involving the mesenteric glands, should be better defined pathologically; viz., "acute mesenteric adenitis" usually representing a non-specific acute inflammatory process that is transient, usually not tuberculous and seldom producing chronic sequelae.

2. Calcified mesenteric glands usually represent quiescent tuberculosis of these glands. These are seldom associated with or followed by tuberculosis elsewhere in the body. Most of these are probably caused by the bovine bacillus and are milk borne.

3. About 50 per cent of children with calcified mesenteric glands apparently have no symptoms that can be traced to any stage of the process, and are found by routine x-ray examinations. Some in this group may be underweight or have at some time illnesses that bring

about study. No treatment other than safeguarding the milk supply is necessary in this symptomless group.[29]

4. From those children who have abdominal symptoms and calcified mesenteric glands we can expect ultimate relief from discomfort in about 80 per cent if hygienic measures are properly carried out for a period of months.[29]

5. In the young adult group studied in this report, we find that thirteen out of fifteen of those who had the larger glands removed at the time of appendectomy were relieved of symptoms. One was re-operated upon for adhesions and one should be re-admitted for further excision of glands.

6. Of the twenty-four who had appendectomy only, thirteen have continued to have the same abdominal discomfort for which the original operation was undertaken and these should be offered the opportunity of a surgical cure.

7. Slightly less than half of those who had exploratory laparotomy and appendectomy only have apparently lost their previous symptoms; some of these immediately and others after a period of time. It was not possible to find any marked increase in the pathologic condition noted in the appendix itself in this group as compared to the unrelieved patients.

8. There was no mortality in either group and no evidence of spread of the disease or other dangerous sequellae to operation. Only one patient later developed active tuberculosis elsewhere.

9. Surgical removal of calcified glands should be confined to those cases with marked symptoms and those so situated as to be safely removed. Great care should be used to minimize the possibility of postoperative adhesions.

REFERENCES

1. Auchincloss, H. A.: Clinical Study of Calcified Nodes in Mesentery, Ann. Surg. *91:* 401-415 (March) 1930.

2. Baglivi, Georgius: The Practice of Physick. London: 1723.

3. Ball, G.: De Tabe Mesenterica. Edinburgh: Balfour & Smellie, 1775 (quoted by Strombeck).

4. Bell, L. P.: Mesenteric Lymphadenitis Simulating Acute Abdominal Condition, Surg., Gynec. & Obst. *45:* 465-473 (Oct.) 1927.

5. Boneti, Theophile: Sepulchretum. Geneva: Cramer & Peractom, 1700.

6. Braithwaite, L. R.: Tuberculosis of Glands in Ileocecal Angle; Cause of Pain in the Right Iliac Fossa, Brit. J. Surg. *13:* 439-451 (Jan.) 1926.

7. Carson, H. W.: The Clinical Aspects of Tuberculous Mesenteric Glands, Lancet *1:* 869-872 (June) 1918.

8. Chute, A. L.: Difficulties Distinguishing Between Urinary Stone and Calcified Abdominal Glands, Boston M. & S. J. *192:* 151-162 (Jan. 22) 1925.

9. Clute, H. M.: Enlarged Mesenteric Lymph Nodes, Boston M. & S. J. *183:* 409-412 (Sept. 30) 1920.

10. Corner, E. M.: Surgical Treatment of Tuberculous Glands of the Mesentery, Lancet *2:* 1825-1827 (Dec.) 1905. Report of 2 cases, Lancet *2:* 726 (Sept.) 1908.

11. Dunham, E. C., and Smythe, A. M.: Tuberculosis of Abdominal Lymph Nodes; Diagnosis by Means of Roentgenray, Am. J. Dis. Child. *31:* 815-831 (June) 1926.

12. Gibson, C. B.: Calcified Abdominal Lymph Nodes, Am. Rev. Tuberc. *29:* 447-460 (April) 1934.

13. Golden, R., and Reeves, R. J.: Significance of Calcified Abdominal Lymph Nodes, Am. J. Roentgenol. *22:* 305-317 (Oct.) 1929.

14. Head, J. R.: Tuberculosis of Mesenteric Lymph-glands, Ann. Surg. *83:* 622-633 (May) 1926.

15. Hepburn, T. N.: Tuberculosis of the Mesenteric Lymph Glands as a Cause of Ureteral Obstruction, J. Urol. *2:* 385-395 (Oct.) 1918.

16. Jamieson, J. K., and Dobson, J. F.: The Lymphatic System of the Caecum and Appendix, Lancet *1:* 1137-1143 (April) 1907.

17. Leonard, M.: Tuberculosis in Mesenteric Lymph Nodes of Children, Am. J. Dis. Child. *41:* 513-527 (March) 1931.

18. Mead, C. H.: Mesenteric Lymphadenitis Simulating Acute Appendicitis, Quantitative Study of Size of Normal Mesenteric Lymph Nodes, Arch. Surg. *30:* 492-527 (March) 1935.

19. Miller, R. H.: Tuberculosis of the Lymphatic System. New York: The Macmillan Co., 1934.

20. Opie, E. L.: First Infection with Tuberculosis by Way of the Intestinal Tract, Am. Rev. Tuberc. *4:* 641-648 (Nov.) 1920.

21. Parker, D. W.: Tuberculous Mesenteric Glands Simulating Appendicitis, Boston M. & S. J. *167:* 915-918 (Dec.) 1912.

22. Randall, A.: Case Report: Tabes Mesenterica, J. Urol. *15:* 493-498 (May) 1926.

23. Richardson, M. H.: A Case of Acute Tuberculosis of the Mesenteric Glands of the Ileocecal Coil; Removal; Permanent Recovery, Phila. M. J. *6:* 1043-1045 (Dec.) 1900.

24. Risley, E. H.: The Preoperative Diagnosis of Tubercular Mesenteric and Retroperitoneal Glands, Boston M. & S. J. *172:* 253-257 (Feb.) 1915.

25. Rowden, L. A.: Differential Diagnosis of Calcified Mesenteric Glands by Radiological Examination, Brit. J. Surg. *13:* 451-457 (Jan.) 1926.

26. Sauvages: Nosolgia Methodica, Tom *II:* 449, 1768.

27. Sherman, H.: Tuberculosis of Mesenteric Lymph Glands. Symptoms of Intussusception Necessitating Resection of the Intestines, Calif. State J. Med. *4:* 43-44 (Feb.) 1906.

28. Short, A. R.: Symptoms Due to Mesenteric Lymphadenitis, Lancet *2:* 909-912 (Nov. 3) 1928.

29. Smith, C. A., and Ames, F. D.: Calcified Abdominal Glands in Children. A Clinical Study, J. Pediat. *8:* 205-225 (Feb.) 1936.

30. Weiss, Soma: Clinical Aspect of Obstructive Diseases of the Common Bile Duct, M. Clin. N. Amer. *10:* 1189-1218 (March) 1927.

31. Strombeck, J. P.: Mesenteric Lymphadenitis. Clinical Study, Acta. Chir. Scandinav. (Supp. 20) *70:* 1-254, 1932.

32. Talbot, F. B.: Early Tuberculosis of the Mesentery Lymph Nodes; Report of 2 Cases, M. Clin. N. Amer. *10:* 1175-1182 (March) 1927.

33. Thomson-Walker, J.: Relation of Calcified Abdominal Glands to Urinary Surgery, Lancet *2:* 1213-1217 (Dec.) 1922.

DEEP CERVICAL ABSCESS SIMULATING LUDWIG'S ANGINA

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THE case to be reported is of interest first, because of the unusual clinical picture; second, because of the comparatively rapid recovery following a modified method of drainage and treatment with azochloramid.

REPORT OF CASE

A 28 year old insurance clerk was seen in consultation at 2:00 a. m., July 9, 1936, on account of pain and swelling in the right of his neck. The onset of his illness had been insidious, beginning ten days before with a mild sore throat and slight rise in temperature. He consulted his family physician two

Fig. 1. The patient immediately after the liberation of pus.

days later when he noticed pain and swelling on the right side of his neck. At this time he was advised to use hot gargles and apply hot dressings to the side of his neck. On the fourth day of his illness he found it possible to take only fluids. The temperature varied from 100° to 103° and the swelling increased rapidly with marked dysphagia. He became progressively worse, taking less

and less nourishment and developing on the tenth day slight dyspnea and complete inability to swallow.

Physical Examination: When first seen patient held his neck rigidly drawn over to the right. He was moderately dyspneic but no cyanosis was observed. He had an anxious facies, the orbital commissures were widened and with a slight apparent exophthalmos. The temperature was 102.8, pulse 100 and respirations 34. A large diffuse swelling extended from the mastoid process down to the sternal notch and in front from the trachea back to the border of the trapezius. The swelling was firm and no fluctuation could be elicited. A brawny type of edema extended from the eye and cheek to the chin and mandible down the neck and over clavicle and sternum to the chest. This was so tense as to make palpation of any of the landmarks of the neck impossible. The maximum point of tenderness seemed to be along the anterior

Fig. 2. The depth of the wound, the incision, and method of drainage.

border of the right sternomastoid muscle at its middle third. The mouth could be opened only slightly, barely permitting a tongue depressor to be slipped between the teeth. Examination of the mouth and throat therefore was unsatisfactory.

Respirations were short and slightly labored. The lungs were resonant throughout, the breath sounds were generally diminished accompanied by coarse rhonchi. The heart was not enlarged, the sounds were forceful, rate 100 to 110 and no murmurs were heard. Blood pressure was 170/110.

White blood cells were 23,500: 88 per cent polymorphonuclears, 10 per cent lymphocytes and 2 per cent monocytes.

Diagnosis: The impression was that of an abscess of the middle cervical fascial compartment. The possibility of Ludwig's angina had to be considered.

Treatment: The patient was immediately removed to the hospital and prepared for operation. Under light gas-oxygen and ether anesthesia an incision was made along the anterior border of the sternomastoid muscle at the junction of the upper and middle thirds. The superficial layer of the deep cervical fascia was incised with liberation of only a few cubic centimeters of pus. At

this time the patient's respirations became labored and cyanosis was observed. Because of his poor condition it was thought best to place a drain and not proceed any further surgically, although it was felt that another pocket of pus existed deeper in the fascial compartments of the neck. The incision was packed with one half inch plain packing saturated with azochloramid (triacetin). Massive hot wet dressings of magnesium sulphate with glycerine were applied to the entire neck. The patient was returned to his room, placed in Fowler's position and given carbon dioxide and oxygen. A Harris rectal drip of 2 per cent glucose and saline was started.

Fig. 3. The apparatus in use.

On the next day the patient's general condition was slightly improved but the edema and swelling had not subsided. Under a procaine pack the incision was explored with a blunt curved hemostat and at a depth of about 4 cm. from the skin surface another pocket of pus was opened and a thick stream of blood-tinged yellow pus gushed forth. Two hundred twenty cubic centimeters of pus was drained at this time. Fig. 1 shows the local condition immediately after the liberation of pus. The cavity was explored with the finger and found to extend up and behind the carotid sheath with another compartment extending down and toward the midline to within an inch of the right sternoclavicular joint. The cavity was flushed forcibly with hydrogen peroxide and then irrigated with azochloramid-saline 1:3300 until the washings were clear.

It was decided to treat this as a closed abscess cavity using Carrel's "puddling" method.

Two small Carrel-Dakin tubes were placed one in each compartment alongside of a Penrose drain. The edges of the wound were loosely packed with gauze saturated with azochloramid (triacetin). The depth of the wound, the incision and the method of drainage can be seen in Fig. 2.

The two Carrel-Dakin tubes were connected to a gravity cylinder containing azochloramid-saline (warm) and a continual drip at the rate of fifty drops a minute was instituted. Massive wet dressings of magnesium sulphate and glycerine were applied around the entire neck and kept warm with hot water bags. Fig. 3 shows the apparatus in use.

Dressings were changed daily and the routine consisted of flushing the cavity with hydrogen peroxide followed by irrigation with azochloramid in saline 1:3300 with a bulb syringe until the washings were clear. The tubes were then replaced and 10 c.c. of azochloramid (triacetin) were slowly instilled. The azochloramid in saline drip was started two hours later and kept going continuously until the next dressing. Hot saline throat irrigations were given every two hours.

The temperature dropped to normal in three days and remained so. Improvement was rapid, stridor and dyspnea disappeared and on the fourth day he was taking a semi-solid diet.

On the fifth day the slough of the abscess wall was removed and from this time on drainage was slight and smear at this time showed only 8 to 12 bacteria per high power field. The tubes were removed on the eighth day and the remaining cavity loosely packed with one half inch plain packing saturated in azochloramid (triacetin) until the cavity filled in from the bottom up. The patient was discharged from the hospital on the ninth day and given neck exercises and several short wave treatments to aid return of function of the neck muscles. When seen last, a month later, there was no limitation of motion in any direction and the incision was well healed.

Comments: A case of deep cervical abscess simulating Ludwig's angina is reported. Treatment by the "closed method" using azochloramid in saline 1:3300 and azochloramid in triacetin 1:500 was quickly effective, leaving no residual disability.

MAYO VAGINAL HYSTERECTOMY FOR UTERINE PROLAPSE AND CYSTOCELE

Indications and Technic

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EXTIRPATION of the uterus through the vagina is an old procedure. Berengarius of Bologna and Andreau A. Cruce of Granada are reported to have performed partial or total hysterectomy by way of the vagina in 1507 and 1560, respectively. In the nineteenth century there was much dispute as to whether vaginal hysterectomy was to be preferred to abdominal hysterectomy. In those days the surgeon's preference was based not on the pathologic condition for which hysterectomy was indicated, but entirely on the mortality and exposure which he obtained with each procedure. Usually he was experienced in only the one type of hysterectomy, and the mortality, which was often greater than 50 per cent, decreased in proportion to his experience no matter which type of procedure was used.

There was little standardization of technic in the last quarter of the nineteenth century, and many types of incisions, now discarded, were used by various surgeons. As has been said, apparently it was the exposure obtained rather than the ultimate condition of the pelvis and perineum on which the surgeon based his preference. Zuckerkandl, for example, advocated a transverse incision between the rectum and vagina from one ischial tuberosity to the other, and stated that he obtained better exposure than when the operation was limited by the vaginal walls. Woelfer advocated a pararectal incision which extended convexly from the superior border of the coccyx to within 2 or 3 cm. of the fourchet. He opened the ischiorectal fossa and extirpated a portion of the coccyx and gluteus maximus muscle before incising the culdesac. Hochenegg advocated an incision similar to a Kraske incision and extirpated not only the coccyx but a portion of the sacrum.

In 1881 Olshausen described an orderly and deliberate vaginal hysterectomy. He cauterized and sutured the cervix, opened both the posterior and anterior culdesacs, stripped the bladder off the uterus in the latter part of the operation, and removed the uterus through the vaginal canal with the cervix preceding it. Noeggerath of New York (1877) is reported to have been the first American surgeon to perform vaginal hysterectomy using methods resembling

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those used today. Christian Fenger in 1881 described his first case in detail; after the usual opening of both the posterior and anterior culdesacs, he ligated both broad ligaments from below upward, closed the vaginal vault entirely, and left a catheter in the bladder.

There was gradual improvement in technic from Christian Fenger's time to 1915 when C. H. Mayo devised an operation which was especially designed to correct the vesical deformity accompanying prolapse of the uterus as well as to remove the uterus. This operation brought the stumps of the broad ligaments extraperitoneally and at the same time used them as a supporting base for the bladder. This is the operation of choice at the Clinic today, with slight modifications in only certain technical details.

It is essential before proceeding with vaginal hysterectomy for cystocele and uterine prolapse to have a clear conception of the mechanism of the production of this abnormality. To correct it by this procedure requires a fundamental knowledge of the pelvic fascia, pelvic muscular floor, and the uterine ligaments in addition to familiarity with the technic.

Pelvic Anatomy

The pelvic diaphragm, which consists of certain muscles and fascia, has been described at length by many anatomists and gynecologists; many differences of opinion exist as to the relative merits of muscles and fascia as supporting structures for the uterus and its appendages, and the bladder and rectum. The pelvic floor may be described as a compact mass in which may be recognized two distinct groups of muscles, the arrangement and functions of which are quite different. The upper group is made up entirely of the divisions of the levator ani muscle and constitutes almost a complete pelvic diaphragm; the lower group or layer consists of smaller muscles derived from the primitive cloaca which surrounds the canals that perforate the pelvic floor to reach the exterior.

The function of this lower group of muscles as judged by their origin and position is sphincteric. This group consists of the sphincter ani externus, transversus perinei superficialis, bulbocavernosus, ischiocavernosus, constrictor urethrae, transversus perinei profundus, and ischiopubicus muscles. Some surround the urogenital canal and others encircle the anus. These muscles, which as a rule are unusually small and whose function is primarily sphincteric, can hardly be considered to afford much pelvic support, especially when they have no attachment to the uterus and adnexa or to the upper portion of the vagina, bladder, and rectum.

The muscles of the upper layer with their aponeuroses constitute the pelvic diaphragm. This group is composed of three muscle bun-

dles designated as the pubococcygeus, iliococcygeus, and ischiococcygeus, the names being derived from the bones of the pelvis to which they are attached. The pelvic diaphragm has been described as a funnel-shaped sling encircling the pelvic viscera, which is deep behind, shallow in front, widely open above, and has a narrow outlet below. According to Fothergill, these muscles are rudimentary structures which attain their highest development in four-legged animals with tails, their function being to lower the tail and to move it from side to side. During the evolutionary process in which the coccyx was reduced to a fixed structure, this function was no longer needed and the ischiococcygeus and iliococcygeus muscles became more fibrous and lost their primary function. The pubococcygeus muscle by virtue of its position surrounds the rectum to unite in the midline behind it; it maintains a definite influence over the rectum. In support of this idea Thompson stated: "The pubo-coccygeus muscle has been profoundly modified in the human subject, in such a way as its influence over the caudal vertebrae has diminished, its influence over the rectum has increased, and a large number of fibers, losing their connection with the coccyx, pass round the rectum to form a sling."

It is hardly logical to assume that these degenerated muscles which have largely lost their contractile power can exert much influence in holding the uterus, vagina, and bladder in their normal relation to each other. The only portion of the levator ani muscle which maintains function is the pubococcygeus or lowest division, and by its contractile power it can raise the rectum toward the symphysis and, by virtue of its position, may aid in constricting the vagina.

Since it is doubtful whether the muscles of the pelvic floor afford much support to the pelvic viscera, this function should rest largely on the pelvic fascia. It is not necessary, however, to trace the various ramifications of this structure, but only to mention briefly those which have intimate attachment to the uterus, bladder and rectum. Fothergill stated that the upper surface of the pelvic diaphragm is lined by fasciae, the aponeurotic coverings of the muscles which form it. The viscera have their own coverings of connective tissue. Part of the intervening connective tissue is loose, part is dense. The denser portion is that which forms the sheaths of the blood vessels, lymphatic structures, nerves, and the ureters. These structures together with their sheaths form lateral masses of tissue which extend between the sides of the pelvis and lateral aspects of the uterus, vagina, and bladder, and which hold these organs in the position they usually occupy.

The upper margin of each lateral supporting mass is in a manner defined by the internal iliac artery and its direct continuation, the obliterated hypogastric artery. The mass is fixed behind by the internal iliac vessels and is firmly attached to the innominate bone. The posterior branch of the artery anchors the mass near the sacrosciatic notch. The obturator artery anchors the mass near the obturator foramen, and the obliterated hypogastric artery fixes it to the abdominal wall. The uterine, vaginal, and visceral vessels run downward and forward to the viscera. The connective tissue ensheathing these arteries and the accompanying veins and lymphatic structures is the support of the uterus, bladder and vagina. The rectum has a separate vascular supply and a separate attachment to the back of the pelvis; it is thus independent of the other viscera and lies loosely in a channel between the lateral masses of tissue which fix them within the pelvic diaphragm.

The Uterine Ligaments

Considerable emphasis has been ascribed to the supporting power of the round ligaments, broad ligaments, and uterosacral and uterovesical ligaments. If the anatomic relationship of these various structures to the uterus and bladder is investigated, it will be doubted whether they offer any support at all. Viewed from the abdominal side it is always noted that the round ligaments simply rest on the broad ligaments and are freely movable; the broad ligaments are merely folds of peritoneum, which can be moved freely from side to side and from before backward and the uterosacral and uterovesical ligaments are composed of peritoneal folds and become fixed only when they are inflamed. Furthermore, all of these ligaments may be surgically divided during the course of abdominal hysterectomy, and even then the uterus will not prolapse, since it remains fixed in its natural position by the lateral masses of connective tissue or parametrium, which in turn is attached to the sheaths of the vessels and to the bony pelvis. It is quite apparent, then, that the principal tissues maintaining the uterus in its normal position in the pelvis are these lateral masses of pelvic fascia and not the usually designated uterine ligaments. These ligaments must not be confused with the cardinal ligaments, which is the name applied to the lateral connective tissue.

Etiology of Cystocele and Uterine Prolapse

Cystocele and uterine prolapse may be congenital or acquired; the condition is not infrequently encountered in virgins and nulli-

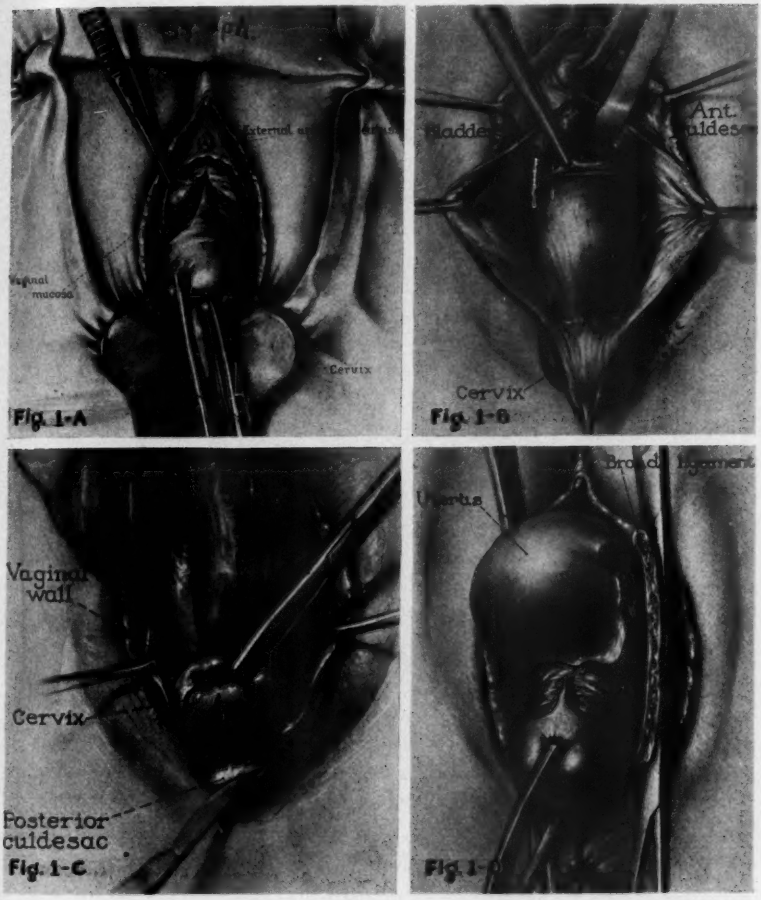

Fig. 1. Mayo vaginal hysterectomy:
A. Incision in anterior vaginal wall extending around cervix.
B. Separation of bladder from front of uterus and cervix.
C. Separation of posterior vaginal wall from uterosacral and broad ligaments.
D. Cutting broad ligament.

parous women. In view of what has been said about the supporting structures of the pelvic viscera, the congenital type follows faulty development or attachment, or both, of the pelvic fascia. Too, the natural apertures through the pelvic diaphragm may be larger than normal, or they may be otherwise defective and the pelvic viscera may become extruded from intra-abdominal pressure. In some cases the uterus is underdeveloped, especially in the pituitary types, and

it is therefore more easily pushed through the normal openings in the pelvic floor. The same condition comes to pass following atrophy of the uterus subsequent to the menopause, when uterine prolapse and cystocele may develop in the nulliparous woman.

Acquired uterine prolapse and cystocele follows stretching, separation, or both, of the lateral masses of the pelvic fascia from their attachments to the uterus and bladder. The degree of prolapse and herniation is determined by the extent of the injury, and it is facilitated by stretching of the muscles of the pelvic diaphragm, thereby enlarging the natural apertures. The muscular perineum does not contribute to the production of prolapse, since it is well known that the perineum can be completely torn in parturition or be divided surgically and there will not be any descensus of the uterus from such injury alone. However, if the uterus is torn loose from its attachments and the perineum is extensively lacerated, the uterus can prolapse through the enlarged opening more readily.

Cystocele may develop separately without uterine prolapse, in which case the lower attachment of the pelvic fascia alone has been separated from the uterus, which allows the bladder and vaginal wall to descend. The combination of prolapse of the uterus and bladder together is certain evidence that the entire upper as well as lower attachment of the parametrial fascia has been loosened or greatly stretched. The association of this anatomic defect and intra-abdominal pressure produces prolapse.

The normal position of the uterus is one of moderate anteversion, giving the impression that it rests on the bladder; however, this is not the case. It is held in this position by the normal attachment of the fascia below the broad ligaments where the plexus of vessels enter the uterus opposite the internal os. In about 20 to 30 per cent of virgins and nulliparous women the upper part of this attachment is faulty or loose and the uterus may become retroverted; if it does not become fixed in this position by inflammatory conditions the condition is not necessarily pathologic.

In parous women, preceding prolapse the uterus practically always becomes retroverted owing to separation of the upper attachment of the parametrium; the uterus then gradually assumes a position in the normal axis of the vagina and prolapse finally takes place. If this upper attachment remains intact, prolapse of the uterus is unlikely.

The rectum, as previously stated, does not contribute to uterine prolapse since its attachments are separate from those of the uterus; but the rectum becomes prolapsed in the acquired form of uterine prolapse, since the lower part of the rectal wall becomes attached

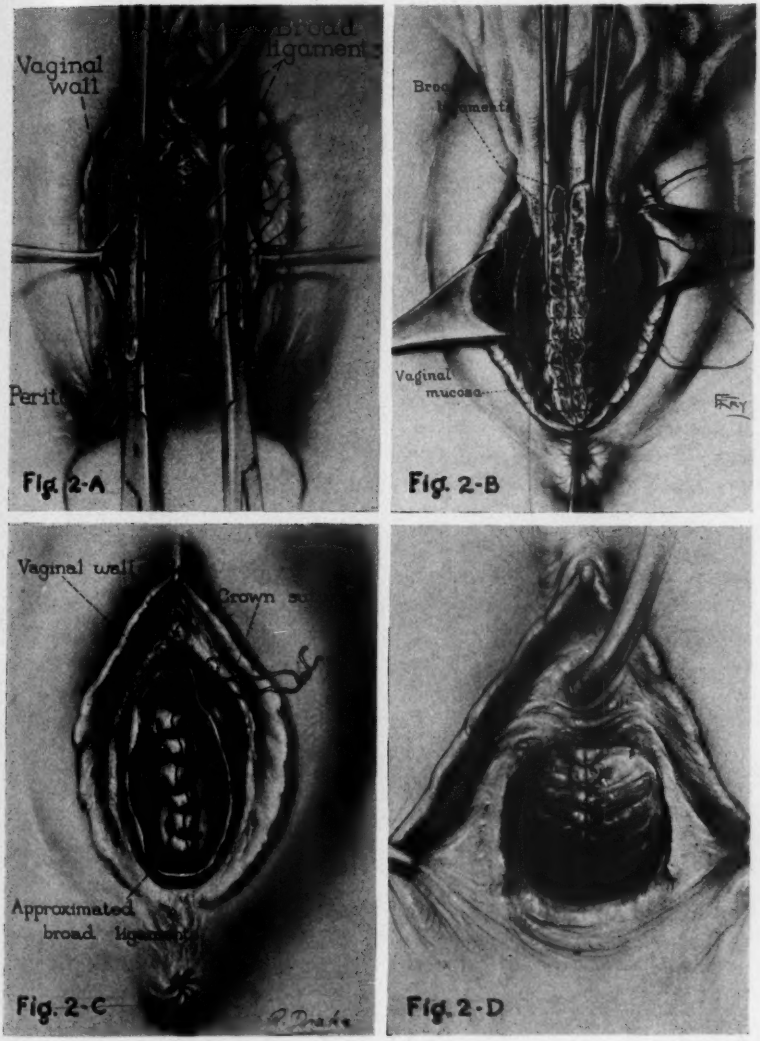

Fig. 2. Mayo vaginal hysterectomy:
A. Obliteration of posterior culdesac by interrupted sutures.
B. Approximation of tissues by continuous mattress sutures.
C. Application of anchoring sutures.
D. Suture of vaginal mucosa.

to the vaginal wall from an inflammatory process resulting from the lacerated perineum, and is therefore pulled out by the prolapsed uterus and vagina. The proof of this is well demonstrated in the

congenital type of uterine prolapse in which there is no injury to the perineum. In this situation, uterine prolapse is never associated with rectal prolapse.

Indications for Vaginal Hysterectomy

Although vaginal hysterectomy is the operation of choice in this clinic for severe uterine prolapse and cystocele, there are other clinics both in this country and abroad in which it is never employed for correction of these conditions. The indications for its use, therefore, cannot be universally accepted by all gynecologists, vaginal hysterectomy frequently being performed for conditions other than prolapse.

There are numerous sturdy women with uterine prolapse, varying in degree to complete procidentia, who suffer very little inconvenience and therefore would not consider surgical repair. The longest duration of complete prolapse without noticeable symptoms within my experience was twenty-five years. When once begun, however, the symptoms are progressive. Bleeding, spotting, or ulceration of the cervix immediately creates anxiety and fear of cancer; not infrequently these may be the only symptoms. Vesical symptoms probably predominate, and they are the earliest symptoms since residual urine varying from a few cubic centimeters to several ounces is usually present. Chronic cystitis then supervenes and is associated with frequency, burning, incontinence, and a bearing-down sensation. With this combination of events, straining and frequent urination become more forceful, and consequently increases prolapse and cystocele.

For debilitated individuals of advanced years, many of whom have cardiovascular complicating conditions, vaginal hysterectomy for prolapse is indicated since it can be performed by the experienced gynecologist with an extremely low risk. In the parous woman the uterus is quite accessible and the operation is practically extraperitoneal. The wisdom of removing the uterus in these cases appears to me to be sound and to be preferable to vaginal plastic repair. The uterus usually has undergone considerable atrophy, and in those cases in which there is uterine bleeding during or after the menopause, early malignancy of the fundus must be excluded. This is not always easy even on microscopic examination of material obtained by curettage. Since in such cases the usefulness of the uterus as a physiologic organ has passed, and since beyond the menopause the incidence of carcinoma of the body of the uterus is high and the operative risk low, it would seem to me to follow that the functionless organ should be removed.

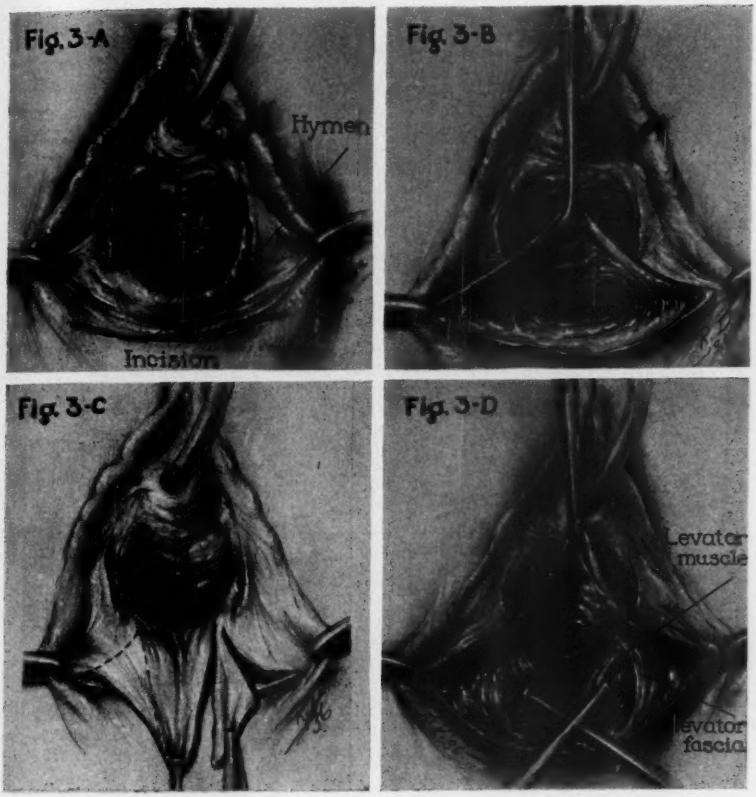

Fig. 3. Restoration of perineum:
A. Stretching of perineal tissue.
B. Separation of posterior flap from rectum.
C. Removal of triangular flaps.
D. Exposure of levator ani muscles.

Technic

Mayo vaginal hysterectomy was designed primarily for the correction of huge cystocele associated with uterine prolapse in elderly women, the purpose being to remove the uterus and construct a support from the tissue of the broad ligaments to support the bladder.

The cervix is grasped with two pair of volsellum forceps and is drawn down well out of the vagina. A pear-shaped incision is now made, with its apex 1½ inches (3.8 cm.) below the external urinary meatus, passing down each side of the cystocele and around the cervix. (Fig. 1, upper left.) The sides of the incision are grasped

and the vaginal wall is readily separated from the bladder by sharp dissection. The apex of the vaginal flap attached to the anterior lip of the cervix is turned down, and the bladder is rapidly separated by sharp dissection from the front of the uterus and cervix. As soon as the peritoneal fold is reached, it is incised and divided laterally. (Fig. 1, upper right.) The posterior vaginal wall is now separated from the uterosacral and broad ligaments and the posterior peritoneal fold is incised laterally. (Fig. 1, lower left.) A small moist pack is inserted anteriorly to protect the peritoneal cavity. The uterus is now withdrawn anteriorly by the use of sharp retractors. This manipulation may be easier by replacing the cervix within the vagina. The broad ligament and the fixed mass of connective tissue on each side of the uterus is fully exposed. The adnexa can now be removed if indicated.

The broad, uterosacral, round, and ovarian ligaments are grasped in one mass on either side of the uterus by four straight, 8 inch (20 cm.) forceps, two through the posterior culdesac and two through the anterior. The uterus is removed about ½ inch (1.3 cm.) from the forceps (Fig. 1, lower right). When the posterior culdesac is considerably relaxed, this is now obliterated by interrupted sutures, picking up the peritoneum adjacent to the sigmoid and laterally over the folds of the uterosacral ligaments (Fig. 2, upper left). This effectively guards against postoperative hernia of the culdesac. The lateral mass of tissue is then approximated and united by a continuous mattress suture of No. 1 chromic catgut behind the forceps, the forceps being removed as the suturing progresses (Fig. 2, upper right). The method of suture is applied so as to interlock and prevent the inward slipping of any vessels. The anchoring suture for the approximated tissue is next applied. A single suture of No. 1 chromic catgut is passed through the vaginal mucosa at the upper angle in such a way as to catch the fascia near the pubic rami as a fixed point. The needle is then brought out in front of the broad ligament, the peritoneum under the bladder is picked up, and then the upper end of the united ligaments, catching the peritoneum and fascia of the pubic bone on the opposite side and bringing the suture out through the vaginal wall. The needle is then reversed picking up only the upper edge of the broad ligaments in its backward course, and the sutures are tied firmly (Fig. 2, lower left). This permanently corrects the cystocele by compelling the bladder to rest on the united lateral masses of tissue. A single lock stitch passes back over the loose ends of the united ligaments to the perineal position. The excess of vaginal mucosa is cut away and sutured to the united ligaments by interrupted catgut sutures (Fig. 2, lower right).

Restoration of the perineum is performed subsequently, as in all operations for prolapse, in such a manner as to bring muscle to muscle and fascia to fascia, in addition to decreasing the lateral and anteroposterior diameter of the vaginal canal. The perineal tissue is stretched by placing a tenaculum just below the labia minora on each side (Fig. 3, upper left). A slightly curved incision is made between these points. The posterior flap is then separated from the rectum by sharp dissection, and includes all the scar tissue in the fourchet (Fig. 3, upper right). A triangular flap of tissue is removed from each side of the posterior flap and the cut edges in the

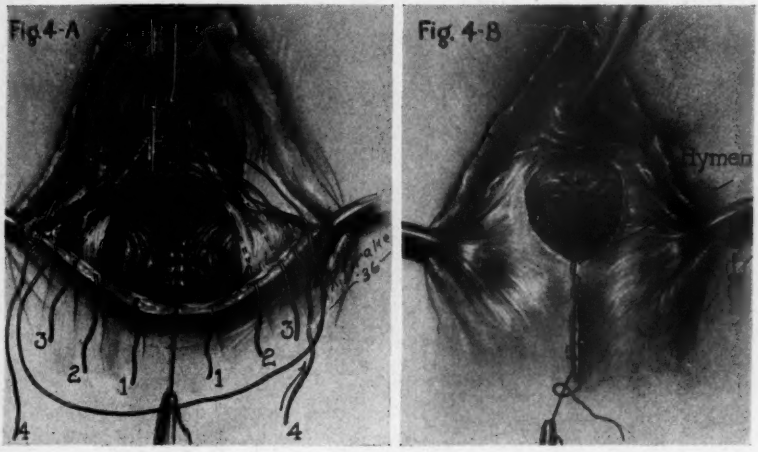

Fig. 4. Restoration of perineum:
A. Union of levator ani muscles and placing of four crown sutures.
B. Closure of perineal incision.

upper angle are united by two or three interrupted catgut sutures, thereby decreasing the lateral diameter (Fig. 3, lower left). The levator ani muscle is exposed by separating the levator fascia and scar directly over the muscle (Fig. 3, lower right). Both levator ani muscles are united with two to four sutures of No. 1 chromic catgut close to the edge where is decussates to aid in forming the sphincter ani. The lowest suture is left long and a forceps placed on it (Fig. 4, left).

Three crown sutures are next placed so that the first one picks up the edge of Colles' fascia, the united levator ani, and the posterior vaginal flap. The second and third sutures are placed about 1 cm. apart, depending on the extent of the perineal defect. These sutures pick up Colles' fascia, inferior levator fascia, levator mus-

cle, superior levator fascia, and posterior vaginal flap. A fourth suture is a figure-of-eight stitch, which picks up Colles' fascia, the inferior levator fascia, the vaginal mucosa, and the posterior vaginal flap, and passes through the same structures on the opposite side. The suture picks up the tissue exactly at the angle formed by the original incision in the perineal scar and the vaginal mucosa; it then passes through the tip of the posterior flap and the corresponding angle on the opposite side (Fig. 4, left). As these sutures are tied, the structures are brought together anatomically, muscle to muscle and fascia to fascia, the sutures being so placed that they control all bleeding when tied. The perineal incision is then closed by the same figure-of-eight suture, which continues as a subcutaneous mattress suture and unites the superficial fascia (Fig. 4, right). This suture is tied to the one left long which is attached to the levator ani muscle, so that, when tied, the knot is drawn into the perineal tissues. There are no sutures or knots exposed to become infected.

REFERENCES

1. Berengarius: Quoted by Hentroin, Fernand: Vaginal hysterectomy. In: Kelly, H. A., and Noble, C. P.: Gynecology and Abdominal Surgery. Philadelphia: W. B. Saunders Company. Vol. 1, 1907, p. 759.
2. Cruce, A. A.: Quoted by Hentroin, Fernand: Vaginal hysterectomy. In: Kelly, H. A., and Noble, C. P.: Gynecology and Abdominal Surgery. Philadelphia: W. B. Saunders Company. Vol. 1, 1907, p. 759.
3. Fenger, Christian: The Total Extirpation of the Uterus Through the Vagina, Am. J. M. Sc. *1:* 17-47 (Jan.) 1882.
4. Fothergill, W. E.: The Supports of the Pelvic Viscera: A Review of Some Recent Contributions to Pelvic Anatomy with a Clinical Introduction, J. Obst. & Gynec. Brit. Emp. *13:* 18-28, 1908.
5. Hochenegg, J.: Die sacrale Operationsmethode in der Gynäkologie. Wien. klin. Wchnschr. *2:* 171-173 (Feb.) 1889.
6. Mayo, C. H.: Uterine Prolapse with Associated Pelvic Relaxation, Surg., Gynec., & Obst. *20:* 253-260 (Mar.) 1915.
7. Noeggerath, E.: Extirpation of the Uterus, New York M. J. *25:* 635; *26:* 65, 1877.
8. Olshausen, R.: Ueber Totalexstirpation des Uterus nach zehn eigenen Fällen, Beitrag zur Kritik der ventralen und vaginalen Operationsmethode, Berl. klin. Wchnschr. *18:* 497-519 (Aug.) 1881.
9. Thompson, Peter: On the Arrangement of the Fasciae of the Pelvis and their Relationship to the Levator Ani, J. Anat. & Physiol. *35:* 127-141 (Jan.) 1900-1901.
10. Woelfer, A.: Ueber den parasacralen und pararectalen Schnitt zur Blosslegung des Rectum, des Uterus und der Vagina, Wien. klin. Wchnschr. *2:* 296-298 (Apr.) 1889.
11. Zuckerkandl, E.: Treatment of Cancer of the Cervix. In: Pozzi, S.: Medical and Surgical Gynæcology. New York: William Wood and Company. Vol. 1, 1891. p. 379.

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VOLUME V DECEMBER, 1936 NUMBER 6

BRONCHIOGENIC CARCINOMA

The most fascinating thing about our profession is perhaps that it is not static. One must like Alice's friend, that famous Red Queen, be constantly running in order to keep his place.

One of the interesting discoveries of recent years is that cancer of the lung is not rare. Not so long ago it was taught that one could not make a diagnosis of primary carcinoma of the lungs without examining microscopically serial sections from every organ of the body. We have learned that, though metastatic tumors are more common in the lungs than primary, the lung is one of the frequent sites of malignant neoplasms. Bronchiogenic carcinoma not only spreads by direct extension through the lung and to the bronchial nodes, but also by metastasis. The metastases are most often to the liver, brain, bone, kidney and adrenal, though any viscus may be involved. At least once the skull has been cracked for a tumor that was secondary to a bronchiogenic carcinoma. Such a possibility makes it more than ever important to secure an x-ray of the chest before investigating surgically a growth elsewhere.

Bronchiogenic carcinoma seems more frequent in men than in women. It occurs usually in persons of middle age or just beyond; but Bigger has reported a case in a boy of 14, and Boyd, one in a man over 80. The age of the patient, therefore, does not exclude the possibility of primary cancer of the lung.

Fortunately the realization that this type of cancer is not a rarity has been accompanied by such advances in technic that the thoracic surgeons now have a goodly number of successful resections to their credit. Among these may be mentioned the pioneer, Evarts Graham (1933), as well as Churchill, Rienhoff, Overholt, and Bigger. Moore, of Asheville, has reported the resection of two tumors of the lung in a recent number of the SURGEON, and Chevalier Jackson's stimulating paper on tumors of the trachea that appeared here last summer must also be mentioned. The SURGEON is proud of having published three original papers in this field.

The alert surgeon, as well as the conscientious diagnostician, must therefore now become "lung cancer-conscious."

The cause of bronchiogenic carcinoma is still obscure. The famous Schneeberg miners have proved that the mechanical irritation from stone dust, the chemical irritation from a dust rich in arsenic and other irritants, and radio-active emanations in the air, between them, result in high incidence. However, such a combination of factors obviously accounts for but few cancers of the lung, and the other etiologic theories have been exploded. William Boyd reports 60 cases from Winnipeg and its environs; not one of these has occurred in a garage worker, although during the long winters the Winnipeg garages are poorly ventilated. We hear, too, that in the mountains of Syria, where automobiles and tarred roads are even less in evidence than in Manitoba, lung cancer is also common. From Iceland, moreover, where the influenza pandemic hit hard, a case has yet to be reported. It is fun to watch theories being exploded.

A year ago in these pages Bigger discussed the diagnosis of bronchiogenic carcinoma. Cough, dyspnea, sputum, hemoptysis, and pain in the chest are among the cardinal early symptoms. Pleural effusion, often blood-stained, is common. Yet, as we have already intimated, the cancer may first cause symptoms through its metastatic foci. Roentgen studies are invaluable. Bronchoscopic examination is positive in 75 per cent of cases, but such a study is inconclusive often enough sometimes to warrant exploratory thoractomy.

Remember, above all, that you will not diagnose bronchiogenic carcinoma if you don't think of it!

EXHIBITS

The wealth of the Scientific Exhibits at the Assembly in New Orleans last spring was impressive: they far surpassed any previous group of exhibits under the auspices of The Southeastern Surgical Congress. At the same time a young and virile organization like this would hate to admit that its ultimate had been attained in any line. While it can hardly be hoped that the University of Louisville School of Medicine alone can outdo the results of the friendly rivalry between Tulane and L. S. U., the Congress does hope that more individual Fellows can stage topflight exhibits, and of course it will welcome exhibits from medical schools distant from the place of the meeting.

There is no feature of a medical convention that is more educational than the exhibits. The papers presented can be read in the quietude of your own study, but the gross specimens, the microscopic displays, the large charts, the colored drawings and such like can not be transported to each Fellow. The exhibits too provide an opportunity to ask questions of the man who has done the work—and he is always only too happy to go into further detail.

If you have something to exhibit, Fellows, write Dr. Beasley.

Rivaling the exhibits staged by the ambitious surgeons of our number are the technical exhibits. These will include the latest types of surgical instruments of all kinds, x-ray and diathermy paraphernalia, the newest books, the most recent improvements in pharmaceutical preparations and just about everything else in the world that will enable a man to give his patients the most up-to-date service. These exhibits are of hardly less value to the practitioner than the scientific exhibits and they excite almost as much interest. The technical exhibits are constantly attended by men who know just what they have to show and they are only too eager to tell the attending surgeons all about their products.

We hate to mention such a thing in our editorial columns, but the fees paid to the Congress for their space help a lot the finances of the organization. These exhibits must be worth while to their backers for most of them are with us year after year. Commerce carries with it the idea of mutual benefit. The commercial exhibits have proved satisfactory to the exhibitors, satisfactory to those attending the Assemblies, and satisfactory to The Southeastern Surgical Congress. There will be a thirty minute intermission in the scientific program each morning and afternoon to allow everyone to study the exhibits, both professional and technical. We take pleasure in recommending all of them.

THE ARMY MEDICAL LIBRARY AND ITS INDEX-CATALOGUE

We like to boast in America that we have the biggest, the greatest this, that or the other. Our claims are not seldom disputed by our friends (and enemies) across the seas, but in one respect they ungrudgingly yield us the palm. It is universally agreed that the Army Medical Library (originally called the Library of the Surgeon General's Office) is the greatest and most complete medical library in the world.

This Library, founded by Colonel Billings and completely catalogued under his direction, was termed by the great Virchow "America's greatest contribution to medicine."

Every one of the more than a million items is available to the physicians of this country. The incunabula and certain other irreplaceable documents of course can only be consulted at the Library, but photostats of these can be arranged at small cost. The books and journals in most demand can be secured by the payment of the express. It is a priceless privilege of the doctors of America and one that should be more freely utilized. But such a library can not be of the greatest service unless its contents are fully indexed.

During the recent years when economy was so widely necessary, a policy of retrenchment made it necessary for the Army Medical Library to allow some of its files to lapse and three years ago the publication of its famous Catalogue was discontinued. One is glad to note that Volume I of the Fourth Series of the Index-Catalogue has appeared this year. The abbreviations and changes in composition in this new volume have effected a saving of 20 per cent in space with accompanying reduction in cost.

If the Army Medical Library is to continue to be the greatest thing of its kind in the whole world, if it is to continue to serve efficiently the doctors of our country, it is necessary that the Congress appropriate enough money to purchase all the current medical books and journals as well as those it failed to acquire during the recent depression, and enough to continue the Index-Catalogue.

The Editor of THE SOUTHERN SURGEON urges the Fellows of this Congress and the other readers of this journal to write to President Roosevelt and to influence their Senators and Representatives to secure money to maintain at the acme of its usefulness the Army Medical Library and its Index-Catalogue.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

ATLAS OF CONGENITAL CARDIAC DISEASE. By MAUDE E. ABBOTT, B. A., M. D., LL. D., F. R. C. P. (Canada), Curator of the Historical Medical Museum and Assistant Professor of Medical Research, McGill University, Montreal, Canada. 60 pages. Price, $5.50. New York: The American Heart Association, 1936.

The recent extraordinary strides in surgery of the heart lend encouragement to the hope that before long the surgeon will be able to correct at least some of the developmental defects of the heart. This would be sufficient reason for bringing this book to the attention of the surgeons of America. A better reason is to salute Dr. Abbott for the completion of this superlative work. This gorgeously illustrated book shows the specimens that won for her Special Honorable Mention at the meeting of the American Medical Association in Atlantic City last year. It represents the distillation of almost a lifetime of careful, painstaking, brilliant labor.

THE EYE AND ITS DISEASES. By 82 International Authorities. Edited by CONRAD BERENS, M. D., Ophthalmic Surgeon, Pathologist and Director of Research, New York Eye and Ear Infirmary; Special Consulting Ophthalmologist, Woman's Hospital; Member of the Society of Surgeons of Paris, etc. 1254 pages with 436 illustrations, some in colors. Price, $12. Philadelphia and London: W. B. Saunders Company, 1936.

Although the reviewer has not been in practice long enough to deliver the grandchildren or even the children of babies he delivered, it seems to him that there has been a growing rapprochement between the ophthalmologists and those physicians who are not so highly specialized. The ophthalmologist, in contrast to those persons who mechanically "fit glasses," can so often render real service as a consultant to the men who practice medicine or surgery and they also have to call upon their colleagues for aid either in restoring vision or handling other conditions which are of more vital importance. The reviewer recalls one famous ophthalmoscopist who made a correct diagnosis of hypertrophy of the prostate on one occasion!

This new volume, the product of 82 international authorities, is a fitting addition to the distinguished group of many-authored books that the Saunders Company has produced. It is well written, well balanced and well illustrated. The oculist should find it useful as a work of reference for details that he does not use every day. The student should be pleased with a book so admirably fitted for a text and the internists, who have in recent years learned to wield an ophthalmoscope pretty efficiently, should often find it of the greatest value.

A TEXT-BOOK OF NEURO-ANATOMY. By ALBERT KUNTZ, PH. D., M. D., Professor of Micro-Anatomy in St. Louis University School of Medicine. Second Edition, Thoroughly Revised. 519 pages with 307 engraved illustrations. Price, $6. Philadelphia: Lea and Febiger, 1936.

The second edition of this text is an improvement on the first principally in being brought up to date. The new chapter on The Autonomic Nervous System is particularly to be praised. Now that this system is so frequently attacked surgically, it behooves us all to refresh our memories in the subject.

The condensation and clarity of the text, the carefully chosen illustrations, the case reports to demonstrate to the student the practical importance of a knowledge of neuro-anatomy, and the laboratory guide all go to make this a splendid textbook.

THE CLINICAL USE OF DIGITALIS. By DREW LUTEN, A. B., M. D., Associate Professor of Clinical Medicine, Washington University School of Medicine; Physician to Barnes Hospital, Saint Louis. 226 pages. Price $3.50. Springfield and Baltimore: Charles C Thomas, 1936.

No apology is offered for reviewing a book on digitalis in a surgical journal. The surgeon who tends to digitalize his patients before operation, or who routinely administers digitalis to a patient with moderate tachycardia after operation, should study this book carefully. He will learn a lot and much of it will redound to his patients' benefit.

DISEASES OF THE AIR AND FOOD PASSAGES OF FOREIGN-BODY ORIGIN. By CHEVALIER JACKSON, M. D., Sc. D., F. A. C. S., LL.D., Professor of Bronchosopy and Esophagoscopy, Temple University, and CHEVALIER L. JACKSON, A. B., M. D., M. Sc. (Med.), F. A. C. S., Professor of Clinical Bronchosopy and Esophagoscopy, Temple University. 994 pages with 2,000 illustrations including 3 plates in colors. Price, $12.50. Philadelphia and London: W. B. Saunders Company, 1936.

More than 300 pages are taken up with a general discussion of the problem of foreign bodies in the air and food passages. How they get there, how to prevent them getting there and the pathology involved, the symptomatology, the diagnosis and the treatment are in separate chapters. Dr. Jackson's style, as readers of THE SOUTHERN SURGEON already know, is wonderfully clear and emphatic. This section is illustrated with photographs, roentgenograms, and original drawings and paintings by Dr. Jackson. It makes the book of real value as a reference work to everyone in general medicine.

The last two-thirds of the book catalogs more than 2,500 cases of foreign body treated by the Jacksons. A photograph of the foreign body, the location, the anesthetic, the instruments used, the problem involved, the result, the time of the operation and remarks are given in each case. The bronchoscopist who has removed but a few hundred foreign bodies of the simpler types should find this book invaluable in its discussion of the unusual cases. He will usually be able to find that the Jacksons present a photograph of a safety pin, or whatever else it was, of exactly the same size and shape, and have described the exact instruments and technic necessary for getting it out. It would seem that every bronchosopist should have this book.

A TEXTBOOK OF OBSTETRICS: By EDWARD A. SCHUMANN, A. B., M. D., F. A. C. S., Professor of Obstetrics, School of Medicine, University of Pennsylvania; Surgeon-in-Chief, Kensington Hospital for Women; Gynecologist and Obstetrician to Philadelphia General and Memorial Hospitals; Obstetrician to Chestnut Hill Hospital, etc. 780 pages with 581 illustrations on 497 figures. Price, $6.50. Philadelphia and London: W. B. Saunders Company, 1936.

It must have cost Dr. Schumann a great deal of self-restraint to devote most of this book to the physiology of pregnancy and to its more common complications. Some of the rarities that a busy practitioner may never see are barely mentioned. His style is clear, interesting and concise. The book is thoroughly up to date, he even gives Bradley Patten's explanation of the fetal circulation. The illustrations are fine and plentiful.

A celebrated obstetrician and professor of obstetrics says, "This is just about the nicest little book on obstetrics I have ever seen."

A TEXTBOOK OF SURGERY. By JOHN HOMANS, M. D., Clinical Professor of Surgery, The Harvard Medical School. 1,182 pages, with illustrations by Willard C. Shepard. Fourth Edition. Price, $8. Springfield and Baltimore: Charles C Thomas, 1936.

The fourth edition in five years! This pudding has certainly been proved.

The informal style, the brief but fascinating historical notes, the excellent type work (it has been reset in toto for this edition) and the extraordinarily fine clear illustrations have all been remarked on before. A student should be grateful to Dr. Homans for so arranging his revision that the pagination remains the same. A new chapter has been added on amputations and plastic surgery.

The reviewer is convinced that no textbook on surgery is better suited to fill the need of the undergraduates than this one and that none is as entertaining.

A TEXT-BOOK OF PHYSIOLOGY, *for Medical Students and Physicians*: By WILLIAM H. HOWELL, Ph. D., M. D., Sc. D., LL. D., Emeritus Professor of Physiology in The Johns Hopkins University, Baltimore. Thirteenth Edition, Thoroughly Revised. 1,150 pages with 308 illustrations. Price, $7. Philadelphia and London: W. B. Saunders Company, 1936.

One of the encouraging things about modern medicine, and perhaps even more about modern surgery, is the growing emphasis on physiology. And it is particularly inspiring that in no field is more progress being made. It is probable that the greatest advances to be made in surgery will be in the further application of newer principles in physiology to surgery. Some of these principles will be discovered by professional physiologists, but others will be worked out by clinical surgeons. All that will advance surgery must of course receive their practical application by clinical surgeons.

It is therefore a genuine pleasure to welcome the thirteenth edition of Dr. Howell's classic text. The book, which has just become of age, has again been extensively revised. In particular, the newer knowledge of endocrinology and the importance of the synthesis of so many hormones are incorporated.

SURGICAL CLINICS OF NORTH AMERICA: Volume 16, Number 3. New York Number—June 1936. 277 pages with 79 illustrations. Philadelphia and London: W. B. Saunders Company, 1936.

It is always a pleasure to pick up a new volume of Surgical Clinics of North America. The June number opens with a symposium on pain, including a paper on total thyroidectomy for the pain of angina. Charles Gordon Heyd, newly elected President of the American Medical Association, gives an excellent discussion of the "Surgical Problems of the Obese and the Lean Patient." Papers on athletic injuries to the muscles and tendons, the more common infections of the hand and on disorders of the parathyroids are most interesting. Dr. Farnum's "Cardiac Disorders in Surgical Patients" is particularly to be commended. He emphasized that operations on patients already known to have diseased hearts carry little additional risk: the moral is obvious.

ORAL DIAGNOSIS AND TREATMENT PLANNING: By KURT H. THOMA, D. M. D., Charles A. Brackett Professor of Oral Pathology in Harvard University; Oral Surgeon to the Brooks Hospital; Consulting Oral Surgeon to the New England Baptist Hospital; Consulting Oral Surgeon to the Tumor Clinic of Beth Isreal Hospital. 379 pages with 533 illustrations, 71 of them in colors. Price, $6. Philadelphia and London: W. B. Saunders Company, 1936.

There is a growing tendency to consider the dentist as a doctor who early in his career specialized on the teeth and contiguous structures. The tendency implies that the dentist is in a measure responsible for the general health of the patient and therefore should realize when the services of physicians of more general knowledge or of special knowledge along other lines are required. The excellent illustrations and the short, accurate descriptions of general diseases should do much to promote this tendency.

This book is designed as a text for the dental student, and a reference book for the practitioner and medical student. It seems to be admirably done. Though of course the physician will not be interested in much of the book he can learn a great deal of value, particularly from the illustrations.

ENDOCRINOLOGY IN MODERN PRACTICE. By WILLIAM WOLF, M. D., M. S., Ph. D. 1018 pages with 252 illustrations. Price, $10. Philadelphia and London: W. B. Saunders Company, 1936.

A great deal of enthusiastic literature in the realm of endocrinology has been published during recent years. "The most outstanding contributions . . . in English, German, French, Japanese, Russian, Italian and Spanish" up to June, 1936, have been consulted, and the author has written a book of more than a thousand pages "with a great deal of enthusiasm."

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